



# SIGNIFICANT INCIDENT REPORT (Final)

Incident: 033394-31122017

Address: Kings Dock Car Park

Date: 31<sup>st</sup> December 2017

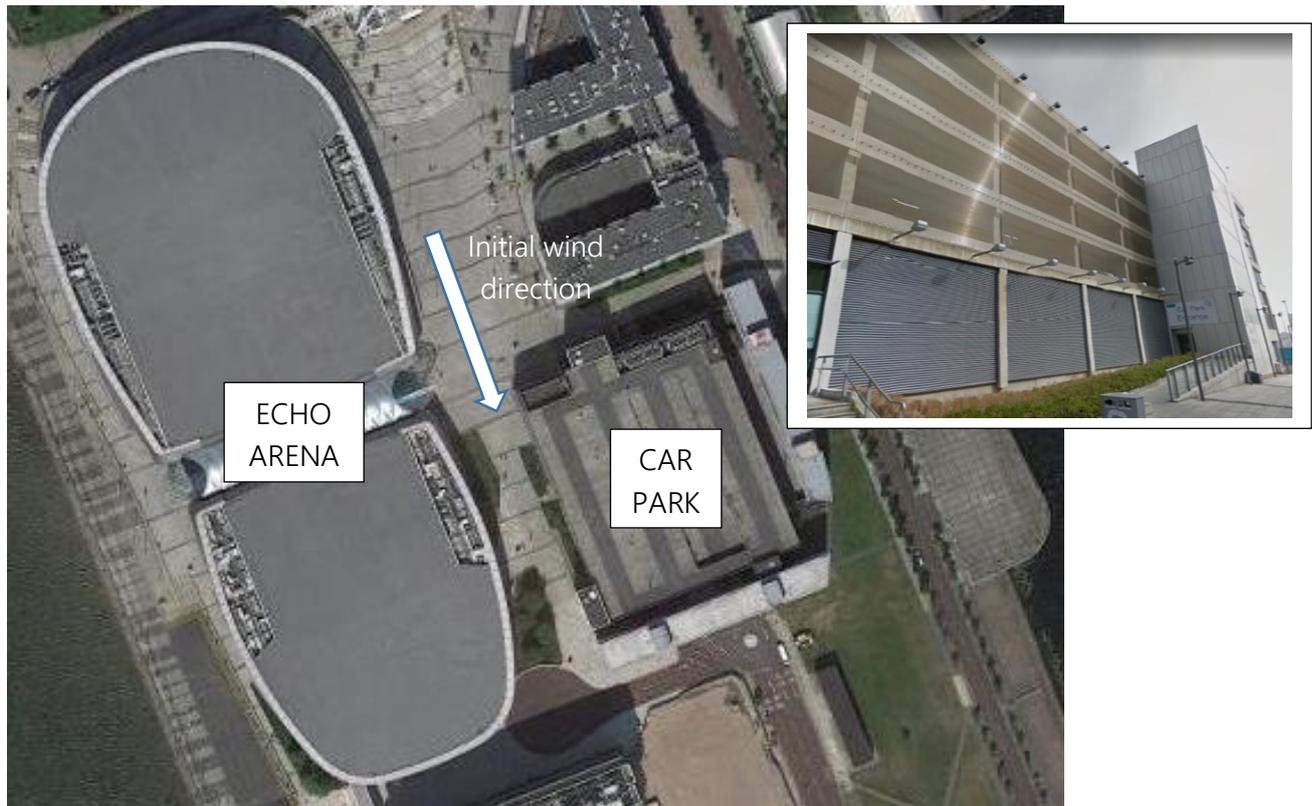
Author: Operational Assurance Team

A Significant Incident Report is completed by the Operational Assurance Team following an event to reflect on the actions of the attending personnel, how procedures were implemented and the utilisation of the equipment. The aim of the review is to ensure the Service continues to improve and maximise all opportunities that support the Service Mission Statement of 'Safer, Stronger Communities, Safe Effective Firefighters'.

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## Incident Details



At 1642hrs on Sunday 31<sup>st</sup> December 2017 Merseyside Fire & Rescue Service (MFRS) were alerted to a car on fire on the 3<sup>rd</sup> floor of the Kings Dock Car Park. The car park comprises of 8 storeys, (ground level plus 7 parking floors) and is located next to the Echo Arena. The car park can hold approximately 1600 cars and was at near capacity due to The Liverpool International Horse Show taking place at the Echo Arena during that day, with the afternoon show about to finish. There were approximately 200 horses taking part in the event which was scheduled to run from 28<sup>th</sup> December 2017 to 1<sup>st</sup> January 2018. To support the Horse Show the bottom level of the car park was being utilised for storage and stabling of 149 horses and their support teams. A further 51 stables were located on the paved hard standing area on Keel Wharf.

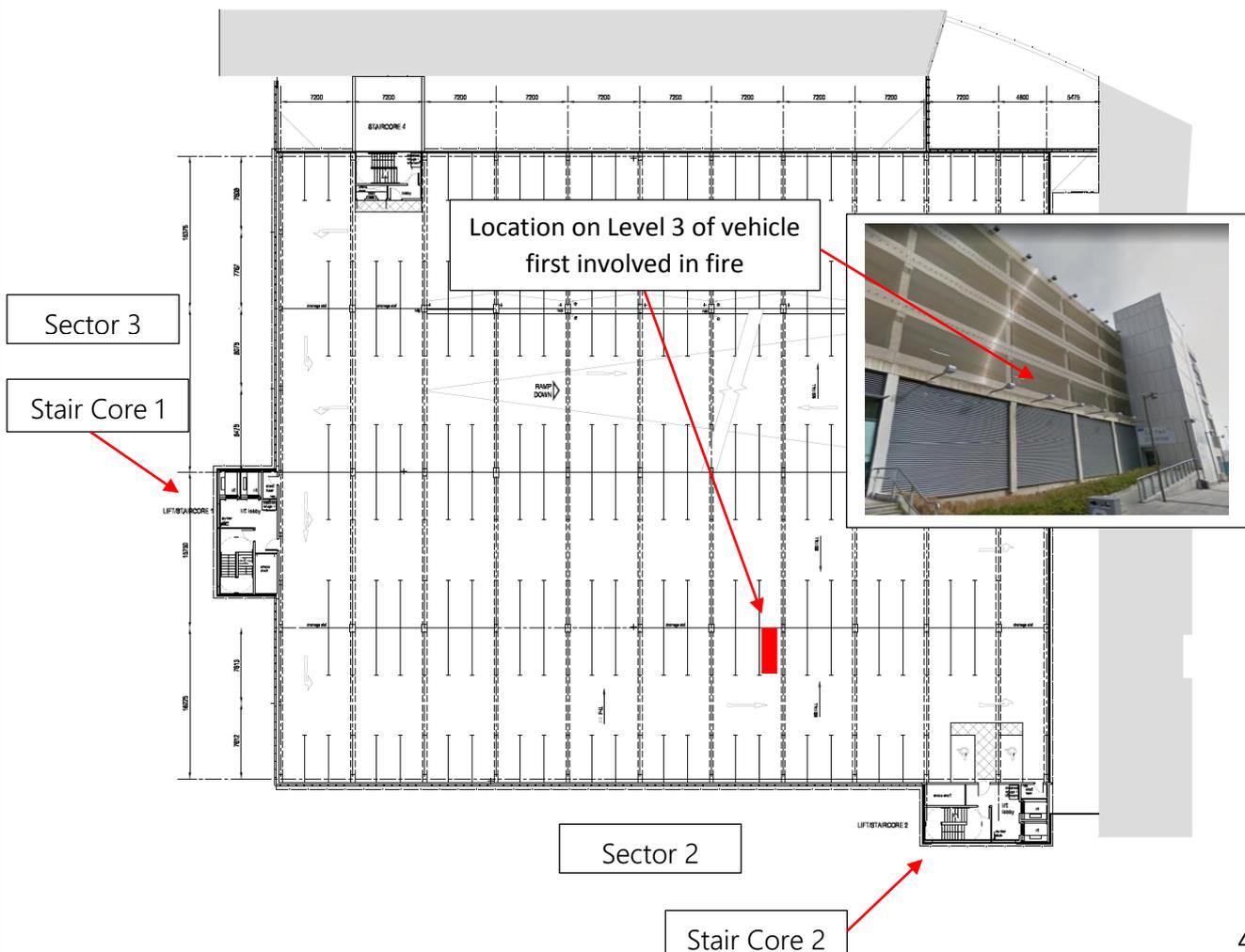
The Kings Dock Car Park is owned by Liverpool City Council and managed through the Arena and Convention Centre Liverpool (ACCL).

Weather conditions were wet and windy and it was going dark at the time of ignition. The initial wind direction was north westerly from the Albert Dock towards the Pullman Hotel but this changed at different stages during the incident.

The first call to the Fire & Rescue Service was made at 1642hrs and the PDA of two fire appliances was mobilised by Fire Control at 1643hrs. The first appliance on scene at 1650hrs was from City Centre (M11P1). The Officer in Charge (OIC) being a Crew Manager (CM). The second fire appliance was from Kirkdale (M10P1) with a Watch Manager (WM) in charge.

Upon arrival at the front entrance to the car park, both OICs report that there were no signs of fire immediately evident. There were a lot of people in the vicinity, including security staff in high visibility coats. The presence of the Echo Arena Fire Event Team van was also noted. The WM and CM spent a few minutes at the front of the car park talking to horse owners concerned about evacuation and after speaking with Echo Arena security staff to capture information on the fire location, they went round the corner to the plaza between the Arena and the car park. Smoke was visible issuing from car park Level 3 and a request was sent at 1656hrs to 'Make Pumps 3 for BA'. The appliances were re-positioned on to the plaza and the dry riser charged.

The WM went up to Level 3 via Stair Core 2 (this would later become Sector 2) to view the fire and after observing multiple cars involved, returned to send an Assistance Message 'Make Pumps 6 for Water & BA' at 1701hrs.



An initial firefighting attack was made externally using a high pressure hose reel which was replaced by two main jets whilst BA operations were being set up on Level 2 of the stairwell. The dry riser outlet was utilised and the first BA team at Entry Control Point (ECP) Alpha was committed at approx. 1708hrs (as shown by BA Board telemetry – tallies being inserted into board). Six BA teams (each of two wearers) were committed from Sector 2 during the early stages of the incident with 3 main jets in use internally on Level 3. 'Make Pumps 8 for BA & Water' was sent at 1731hrs. The first attending Station Manager (SM) was now the Incident Commander (IC).

BA teams reported numerous loud bangs with the structure physically shaking, significant amounts of running fuel on fire and ignited fuel running down from Level 4 close to columns. This could have been a visible indication that the structure or drainage channels and pipework had failed – see section on fire progression Page 37.

Prior to BA Team Alpha 5 being committed, the first attending Group Manager (GM) took over as IC and a further assistance message 'Make Pumps 12' was sent at 1741hrs.

A second sector was opened, Sector 3, from Stair Core 1, to allow crews to attack the fire from an opposing direction with a view to surrounding and containing the fire on Level 3. Two BA teams were committed from Sector 3 ECP Bravo, a team of three wearers on Level 3 and a team of four wearers on Level 4.

BA teams Alpha 5 and Bravo 1 report seeing each other on Level 3 and state that the fire had been surrounded and contained within the second and third rows of cars.

With the opening up of Sector 3, water supplies were becoming over run. Team Bravo 2 on Level 4 describe having a very poor water supply, requiring them to unfurl their Cleveland Roll by hand due to insufficient pressure in the hose line. Team Bravo 2 reported that there were approximately 10 cars involved on Level 4. Visibility was such that they could not confirm if more cars were involved or whether the fire had spread up to Level 5 at this point.

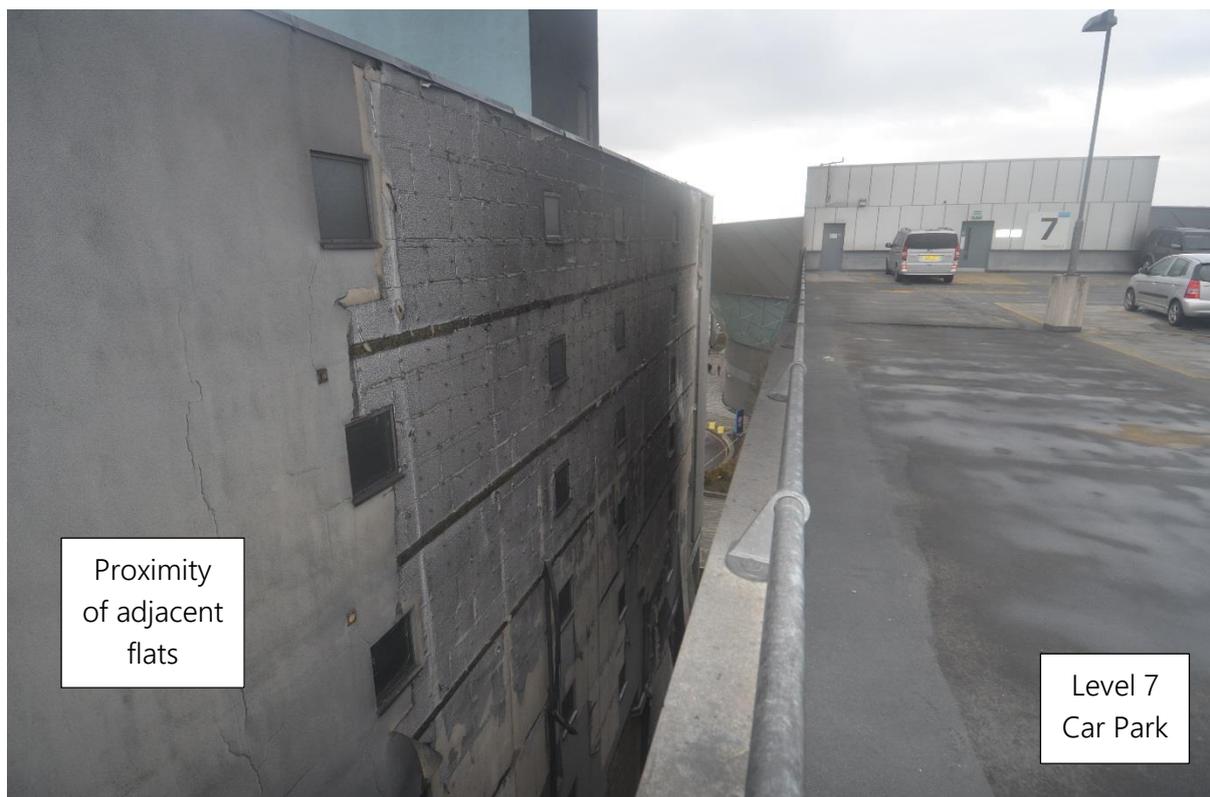
Conditions downwind in Sector 2 were deteriorating rapidly and all committed BA teams along with personnel in the stairwell were evacuated. The SM in command of Sector 3 was aware that the evacuation had taken place from Sector 2 but did not withdraw the BA teams in his Sector as conditions were more tenable due to being upwind of the fire.

BA activities in Sector 3 continued for approximately 15 minutes after Sector 2 withdrew, until a board evacuation was instigated at ECP Bravo due to deteriorating conditions across the whole of the structure.

Due to the poor water supply and the fact that the fire was escalating and moving around them, Team Bravo 2 had already begun to withdraw. Prior to reaching the stairwell they received the evacuation signal via their BA telemetry.

The Chief Fire Officer (CFO) took over as IC prior to both evacuations taking place.

From this point onwards firefighting was external only, with the primary focus on protecting exposures and the flats surrounding the car park.



A major incident was declared by the Chief Fire Officer (CFO) at 1821hrs. This was communicated at the incident and locally through multi-agency meetings. The METHANE message was not passed until 1849hrs due to the fire escalation at this time within the car park, which resulted in the Command Support vehicle repositioning due to heavy smoke logging in the area.

Three combined platform ladder (CPL) aerial appliances and 3 high volume pumps (HVP) were requested during the course of 31<sup>st</sup> December and open water was drawn from Dukes Dock using a fire appliance. Once additional water supplies were accessed the fire was brought under control. Firefighting and damping down continued until the Stop message was sent at 0734hrs 2<sup>nd</sup> January 2018.

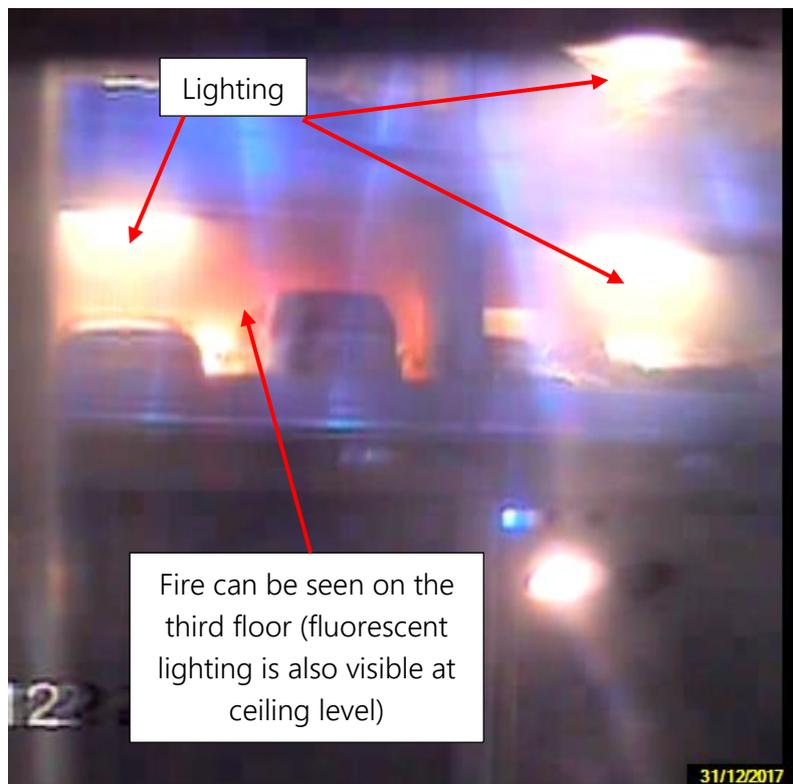
The car park structure was severely damaged by fire and 1150 vehicles are thought to have been destroyed. Six dogs were rescued during the incident, four from the Level 7

and two from Level 2. Two further dogs were reported missing on Level 2 and are presumed to have perished due to the information given by the owners as to the location of their vehicle and the severity of damage in that area.

No firefighting personnel were injured during the incident, however, staff employed by the Arena and Convention Centre Liverpool and members of the public were treated on scene by St Johns Ambulance for smoke inhalation. This was due to reported smoke ingress through air conditioning ducts into the service area of the arena and general smoke travel in and around the vicinity of the incident. A total of 32 persons were triaged by St Johns Ambulance, one of which was experiencing an asthmatic episode, one was experiencing convulsions and one suffering with chest pains. The Tactical Commander for NWS was mobilised on request of St Johns Ambulance as a lead clinician to assess the patient presenting with asthmatic difficulties. On arrival, the Tactical Commander initiated a response from NWS based on the scale of the incident and emerging patient numbers. NWS resources were summoned and assisted with triage and treatment in the latter stages as this area developed. Three persons were removed to the Royal Liverpool Hospital by ambulance for precautionary checks, the last being released from hospital at approximately 0300hrs on 1<sup>st</sup> January 2018.

## Incident Photographs

Image from plaza (Echo Arena) CCTV at 1643hrs – first 999 call to Fire Control at 1642hrs



1656hrs – High pressure hose reel is deployed externally on to the fire – initial action by the first appliance in attendance.



1711hrs – Two main branches deployed



## Summary of Timeline

Time	Details
16:29	Internal car park CCTV - first signs of fire (smoke) from the vehicle
16:33	Internal CCTV - steady stream of smoke from vehicle
16:37	Internal CCTV – initial signs of flame from vehicle
16:41	CCTV on plaza shows first image of fire (Page 7)
16:42:17	First call to the Fire & Rescue Service
16:43:52	Two appliances mobilised
16:45	Echo Arena Fire Event Team arrive at car park main entrance under blue lights 
16:50:59	First appliance books in attendance at the entrance on the south side of the car park. This time is used as the datum point for further actions which are timed via the appliance CCTV from when the appliance first stops at the incident. 2 <sup>nd</sup> appliance arrives at 1651hrs, the first attending WM is the Incident Commander (IC) at this point 
16:53	1 <sup>st</sup> fire appliance re-positions onto the plaza

16:54	2nd fire appliance re-positions on to the plaza  
16:56	Following external observations by the WM , he sends 'Make Pumps 3 for BA'
16:56:40	Hose reel directed on to the fire floor externally. From the position on the ground, Firefighters can see no flames issuing from third floor, only smoke
16:59:09	Access gained to dry riser – security provide keys
17:01:39	Following an internal inspection via Stair Core 2 on Level 3 of the car park, the WM observes multiple cars on fire and 'Makes Pumps 6 for Water & BA'. First attending SM mobilised
17:02	Further SM mobilised for Operational Assurance purposes
17:03	GM mobilised
17:04	Dry Riser is charged
17:08	First BA crew committed via ECP Alpha in Sector 2 – Team Alpha 1 – M11P1
17:08	Internal CCTV shows signs of Firefighter torches through heavy smoke, confirms commitment of BA Team Alpha 1 (internal car park CCTV 22mins fast, time on CCTV 1730hrs)   <small>Playback : Frame : 10744/24673 31 Dec 2017 17:30:30</small>
17:09	Alpha 2 committed - M10P1 - initially managed hose for Team A1 but were subsequently given a second main branch to continue firefighting
17:30	First attending SM now IC
17:31	Assistance message sent to 'Make Pumps 8 for BA and Water'
17:31:34	Alpha 1 cleared from BA board, Team A1 report that they worked their way along the 2 <sup>nd</sup> row of cars, extinguishing cars as they went. They reported that cars were

	re-igniting behind them as they went. Lots of loud bangs making communications difficult and building was shuddering. Left their main branch with Team A2 who continued firefighting with two main branches
17:35:56	Alpha 3 committed - M12P1 - continued firefighting along 1 <sup>st</sup> roadway, between rows one and two, again reported lots of explosions, running fuel fires and thought they could see ignited fuel falling down from floor above, requested CAFS (Compressed Air Foam System) but this was not implemented while they were committed.
17:39:47	Alpha 4 committed - M16P1 – continued firefighting along 1 <sup>st</sup> roadway between rows one and two, and state there was no fire in row one, reported they were ‘just pushing the fire around’. Lots of running fuel
17:40:31	Alpha 2 cleared from BA board – by the time Team A2 had left Level 3 they reported that possibly up to 30 cars were then involved and a running fuel fire could be seen between the two rows of cars
17:41	First attending GM now IC, ‘Make pumps 12’ sent CFO mobilised
17:45	Survey of scene undertaken to north of car park building. GM designated first attending SM to set up Sector 3 and deploy BA crews through a bridgehead (ECP Bravo) into Level 3 to surround the fire. Second SM instructed to assist with this task. Difficulties recognised with regards to relocating appliances and personnel from the south side to the newly opened Sector 3. Water supplies also proved problematic to supply the riser in Sector 3 but were established prior to BA team Bravo 1 being committed, approximately 22 minutes later, at 18:07hrs (see below)
17:46:34	Alpha 5 committed – M12P2
17:52	Internal CCTV on Level 4 shows a visible fire roughly located above the initial seat of fire on Level 3 – fire spread may have happened earlier but unable to confirm exactly when due to smoke obscuring camera view
17:55	CFO arrived at the incident
17:57	First attending Area Manager (AM) arrived at the incident
18:01:12	Alpha 4 cleared from BA board
18:05 (approx.)	Alpha 6 committed – M12P1, unable to confirm exact times for BA Team A6 as Merlin Board download not possible. Team A6 stated when they entered Level 3 there was a main branch on the floor which they then used. This must have been left in situ by Team A4 when they withdrew as the other two branches were in use by Teams A3 & A5
18:07:00	BA Team Bravo 1 committed from Sector 3 onto Level 3 – team of 3 – reported that they could see Team A5 on the same roadway as them (between rows three and four) but on the other side of the fire. Wind was blowing products of fire away from them so conditions were tenable and visibility good. Stated that the fire was confined to rows two and three and had not spread to row four. Reported part of ceiling coming down and spalling concrete with lots of burning fuel running down from above. The underside of vehicles on the level above could be seen through the failing concrete ceiling from Level 3
18:12:23	Alpha 3 cleared from BA board
18:16:55	Alpha 5 cleared from BA board – were aware of sounds of failing structure and could see parts of ceiling falling down

18:20 – 18:25 (approx.)	Alpha 6 cleared from BA board – also observed signs of holes in floor above and ignited fuel running down, conditions were deteriorating so withdrew. At this point all BA had been withdrawn from ECP Alpha due to the untenable conditions on Level 3
18:21	Aerial appliance - CPL requested
18:21 approx.	CFO takes over as IC, GM now Operations Commander, AM now Command Support Officer for CFO. CFO requests a METHANE message be sent and a Major Incident declared (this METHANE message is not sent until 1849hrs due to the CSU having to relocate, see below)
18:25	Smoke black out of external area captured by CCTV by the Pullman Hotel following an escalation or change in fire conditions inside the car park 
18:29	Bravo 2 committed to Level 4 – team of 4 – the team were only in the risk for approx. 10mins before they withdrew due to poor water pressure and escalating fire conditions, received an evacuation signal via BA telemetry whilst withdrawing
18:33	Command Support Unit has to relocate due to smoke logging in vicinity of car park main entrance
18:37	Fire appliances from Sector 2 are driven up the plaza away from escalating fire
18:37	Due to deteriorating internal conditions, Bravo 1 withdrew to ECP Bravo just prior to ECP being evacuated
18:38	Emergency Evacuation ECP Bravo – Bravo 1 & 2 cleared from board
	From this point firefighting activities continued externally with the focus on confining fire spread to the car park and protecting the adjacent flats. This was achieved through a combination of ground monitors, CPL water towers and jets directed from floor level and openings in adjacent buildings
18:49:45	Major Incident declared, METHANE message sent, full informative given, detailing numbers of vehicles involved, potential building collapse and evacuation of members of the public from the surrounding area
18:56:11	'Make CPLs 2' sent
19:05:50	Assistance message sent requesting attendance of High Volume Pump (HVP)
19:09	Additional GM mobilised to Fire Control
19:26	Second AM directed to attend Tactical Coordinating Group (TCG) at Service Headquarters
19:50:48	Incident structure at this time was as follows: <ul style="list-style-type: none"> <li>• Sector 1, SM in charge , objective to prevent fire spread to apartment blocks</li> </ul>

	<ul style="list-style-type: none"> <li>• Sector 2, WM in charge, use of several main branches externally into car park structure</li> <li>• Sector 3, SM in charge, objective to prevent fire spread to Staybridge Hotel and protection of underground service road connecting to the Arena</li> <li>• Sector 4, SM in charge, objective to protect nearby apartment blocks and to direct firefighting jets from within residential block corridors onto upper levels of car park</li> </ul>
20:00:13	Assistance message, 'Make HVPs 3'
21:10:39	Council structural engineer initially declares that the car park structure is rated for 90 minutes fire protection (as per incident log). All sectors are advised and a Safety Officer is established in each sector. The fire protection period was later revised to 15 minutes and this information would inform firefighting tactics from this point
	Firefighting activity continues until the morning of 2 <sup>nd</sup> January, appliances relieved and rotated through strategy relayed by Fire Control. Senior Officer group maintains attendance throughout and facilitates numerous multi agency meetings to agree business continuity, building stability and repatriation of vehicles/property
07:45:53 2/1/18	Fire appliances leave scene following external handover. Firefighting assets employed for a total of 39 hours 2 minutes. (mobilisation to last appliance becoming available)

The BA boards used at the incident were not synchronised with Vision or each other and the following anomalies have been identified:

- Merlin Board 25      Used initially in Sector 2 was 27 seconds slower than Vision
- Merlin Board n/k      Used in Sector 2 by Team A6 but unable to identify Board used
- Merlin Board 39      Used in Sector 3 was 1 minute 15 seconds in advance of Vision

Images observed to establish the timeline were from the following locations:

- Exterior car park CCTV – at front entrance of car park
- Internal car park CCTV – Level 3 adjacent to entrance door in from Stair Core 2
- Echo Arena CCTV – on plaza between Arena and car park approx. level with seat of fire and between Arena and Pullman Hotel
- Fire Appliance CCTV

## Observations from the Operational Assurance Team

### 1. Pre-Determined Attendance (PDA)

The PDA for Kings Dock Car Park was 2 appliances.

In an immediate review of the PDA following the fire, considerations were given to the similarities between the structure of a concrete multi storey car park and a high rise building. Firefighting techniques within the two building types are consistent with the utilisation of dry risers and crews committed from a bridgehead.

Further consideration was also given to the fire loading when multi storey car parks are close to capacity and the short distance between parked cars. This undoubtedly contributed to the rapid fire spread within the Kings Dock fire.

Following the Kings Dock Fire, the Service took the decision to increase the PDA to fires reported in multi storey car parks to a Level 2 High Rise PDA; 4 x rescue appliances and a CPL.

Standard Operating Procedure (SOP) 1.5 Mobilising and Communications, Section 3.1, states that normal attendance to reports of fire is two appliances unless a PDA has been set for exceptional risks such as "Persons Reported," hospitals, Mersey tunnels, etc.

#### Action/Observation

- Observation – The initial PDA for this incident was in accordance with the SOP, however, the PDA has been increased in view of the outcome of the Kings Dock Car Park incident.
- Action – Operational Planning to undertake a review of the PDA for multi-storey car parks and to confirm whether this increase will remain as a permanent measure.

### 2. Site Specific Risk Information (SSRI)

No SSRI was in place for the Kings Dock Car Park at the time of the incident as the Service adopt a risk based approach and this building type did not fall within the criteria for inspection.

SSRIs currently in place for;

Echo Arena 11/218, Liverpool Exhibition Centre 11/705, Staybridge Suites 11/218, Jurys Inn 11/142, Pullman Hotel 11/693 (Protection visit only), Royal Quay 15/072, Wapping Dock Flats 11/181, City Centre Waterfront 11/304, Hotel Ibis 11/377.

The Kings Dock Car Park is only referred to within the Echo Arena SSRI due to its electric intake being located within the car park boundary.

The only car park with an SSRI in the City Centre is Liverpool One Q Park 11/221. The Q Park supports the Liverpool One Shopping Centre and an SSRI exists due to it being located underground with emergency plans that incorporate fire engineered solutions which operational crews need be familiar with in the event of an incident.

A City Centre Waterfront SSRI is in place for water rescue scenarios and does not indicate access points for open water pumping operations.

SSRIs for surrounding risks identify the locations of open water Emergency Water Supplies (EWS). Echo Arena 11/218 highlights Dukes Dock and Liverpool Exhibition Centre 11/705 highlights Albert & Queens Dock.

SSRI guidance resides within the Operational Information Centre which is an all-encompassing platform with links to the SSRI progress system. The SSRI system was initially populated by the migration of 7.2d information and additions are generally identified locally or through a risk based approach.

Undertaking SSRIs in car parks has previously been generally discounted due to the perceived low risk associated with their construction and lack of historical local incidents involving this type of structure.

#### Action/Observation

- Action - The SSRIs for Liverpool Echo Arena 11/218 and the Waterfront 11/304 need to be revisited and updated to reflect ancillary structures such as car parking, grounds, access points, water supplies, etc.
- Action - Review SSRIs for other waterfront risks, to ensure water supplies; pressure fed and open water access points, are captured. A link should be included to reference SSRI Waterfront 11/304.
- Action - Review procedure for SSRIs for other multi-storey car parks, both above and below ground. Consideration should also be given to the buildings in close proximity to the car park and whether additional plans are required to protect from fire spread.

### 3. Public Events Briefings (PEB 1)

The Public Events Briefings (PEB 1) process within MFRS runs in partnership with the Safety Advisory Group for each district. This includes Merseyside Police, Local Authorities and Event Organisers for the responsibility of planning large public events from an Operational Planning and Fire Safety perspective.

The Echo Arena provide a list of events to MFRS Ops Planning on a monthly basis. The list will generate PEB 1s to inform operational crews of events taking place across Merseyside and how the events may effect operational response, e.g. road closures, etc. Operational crews are asked to feedback any issues which have affected (or may potentially affect) MFRS appliances responding to or dealing with an incident at an event or in its vicinity.

This was the third year that the horse show had run. A PEB 1 was generated for the first event with no feedback received from operational crews. PEB 1s were not issued for the following two events (2016 and 2017) due to the original document still being valid.

The original horse show PEB 1 produced in 2015 makes reference to the pontoon area being used for fixed stabling units and as this only accounted for a relatively small area of access for open water supplies, it was not identified that this would greatly hinder operations.

Guidance surrounding PEB 1 content is provided in SI 0609, which identifies events in station areas and makes reference to the feedback section of the form.

After consultation with Ops Planning, in the seven years that the PEB 1 process has been running no feedback has ever been received from operational crews for an event.

Action/Observation

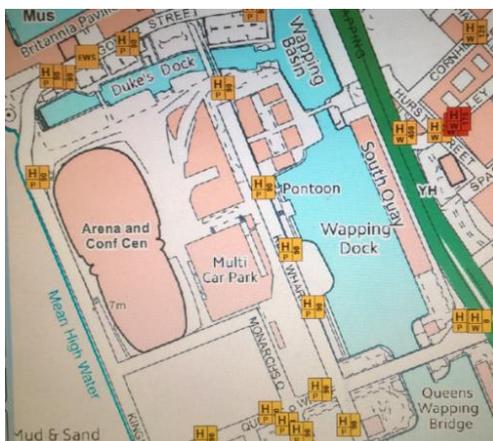
- Action - Ops Planning to reinvigorate and review PEB 1 feedback process from operational crews.
- Action - Ops Planning to reissue PEB 1s for recurring events irrespective of whether feedback has been received or not.
- Action - Ops Planning to improve links with Echo Arena event organisers and to attend table top exercises where appropriate. This may be expanded to include other event organisers within Merseyside.

4. Water Supplies

The Mobile Data Terminal (MDT) hydrant overlay software, on the date of the incident, did not show all United Utilities (UU) or private hydrants. The initial attending crews located two hydrants between the car park and the Pullman Hotel which were not indicated on the MDT.

An upgrade to the hydrant software was planned in 2018 which provides access to all hydrants plus water main routes and sizes. The differences between the two overlays can be seen below;

MFRS MDT Hydrant Overlay



UU & MFRS Combined MDT Hydrant Overlay



Initial water supplies appear to have been sufficient to supply three main jets in Sector 2 (Stair Core 2). Water supplies began to overrun once a second sector was opened (Sector 3 Stair Core 1). This is now known to be attributed to water supplies being sourced from the same ring main, albeit they were physically separated by some distance. This water ring main runs around the Kings Dock estate and is a 250mm main with branches of 160mm running off it. Both initial Sectors were set into hydrants on the 160mm branches.

It was evident early in the incident that pressure fed water supplies were starting to be overrun as a result of internal firefighting tactics. This was exacerbated by the introduction of ground monitors and aerial appliances as water towers. The demand for water was remedied by the introduction of three HVPs and open water feeds.

BA Team Bravo 2 in Sector 3 stated that the water pressure was so low in their main hose line on Level 4, that it would not unfurl the Cleveland Roll.

United Utilities were requested to attend the incident at 2002hrs but there is no clear indication on the incident log of them arriving on scene or of any actions carried out.

One area identified as an access point for setting into open water was a paved area on Keel Wharf which allows access into Wapping Dock. This area was taken up by temporary stabling for the Horse Show and could have been identified in the planning stage to be kept clear for emergency access.

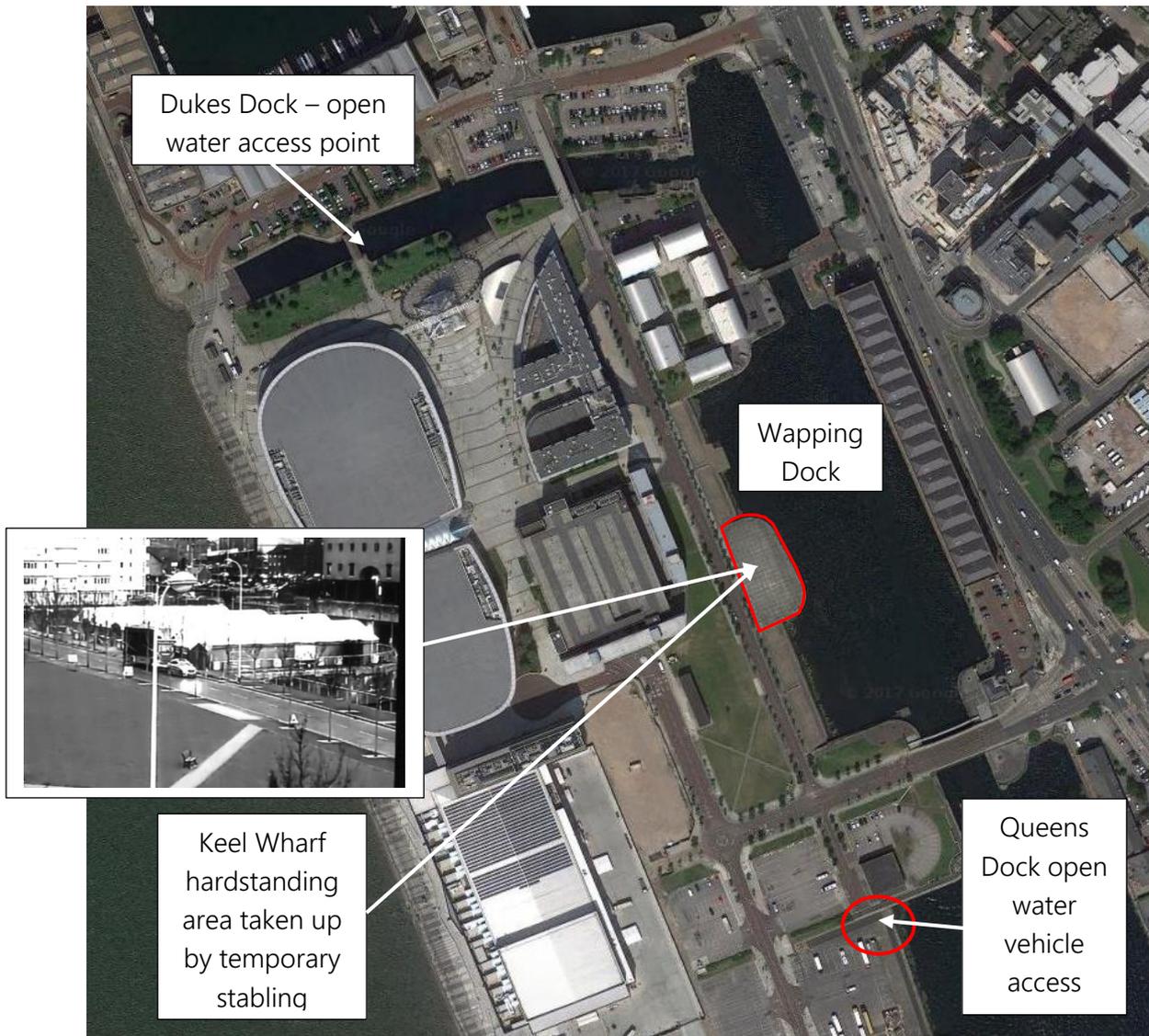
Some crews were unfamiliar with locations that could be accessed to obtain an open water feed, although this was eventually established in Dukes Dock.

Another alternative may have been to utilise the Light Portable Pump (LPP) resource based at Kirkdale. This carries 6 LPPs which have a maximum output each of 1200lpm. Information from the supplier's website states that this output is based on a single length of hose over flat ground.

The Hose Layer Unit at Kirkdale may have provided an alternative method for improving water supplies to the incident. It is comprised of large diameter lay flat hose (1350m of 102mm hose) but would have required a Water Relay system to be set up. This would have taken up valuable resources in re-deploying fire appliances as base and intermediate pumps and would have had the effect of interrupting firefighting tactics in the early stages.

A Water Officer was appointed and used a mobile phone camera to capture the MDT hydrant overlay image due to failure of the appliance printer. This had been interpreted by some staff on scene as using a mobile phone application. The Water Officer's main objective was to identify the nearest and most readily available hydrants from the information provided by the MDT. Once all of the surrounding hydrants had been exhausted, the Water Officer assisted with locating a site for HVP access and deployment.

The Fire and Rescue Service Act 2004 Part 5 details the responsibilities of the Local Fire and Rescue Authority and water provider and the relationship to be achieved in provision of adequate water supplies.



The hydrants that are sited around the Arena are private and therefore are not captured by Fire and Rescue Service hydrant walks (HYD1 forms). Testing of these hydrants is conducted annually by MFRS Water Section technician and records stated that the most recent test took place in November 2017. The MDT identifies private hydrants that were tested, but does not capture several additional hydrants around the periphery of the Arena. It is worthy of note that hydrants are tested individually for flow requirements for BS750 (1700 litres per minute) but are not tested as a group to replicate demands of a protracted incident.

#### Action/Observation

- Observation - Although an aerial view of the incident location displays multiple open water sources, there is minimal access to allow an appliance to draw from open water in close proximity to the car park. The one area that would have provided access was populated by fixed stabling for the horse show.

- Action - Not all information regarding water supplies was available to crews at the incident. This has been rectified with the upgrade to the MDT software in March 2018.
- Action - The Service to consider creation of a formal HVP and water plan in and around the dock areas and incorporate into local SSRI's.
- Action - The Echo Arena Management Team run table top exercises in preparation for the majority of their events, but this is for internal staff and specific event organisers with no other agencies invited. This was discussed in the multi-agency debrief and the suggestion of inviting outside agencies to any event that is beyond the footprint of the Arena was accepted and will be built into future plans.

## 5. Firefighting Media

Water was the primary firefighting media used at the incident. It is deemed to be the most effective option for internal firefighting due to its cooling properties, latent heat of vaporisation (water's ability to absorb heat) and ability to adjust the branch to divide the water particles for optimum performance in mitigating fire development. This tactic is delivered through core training to all operational personnel.

CAFS was considered by earlier attending crews but discounted as there were concerns about its use for internal firefighting and interrupting firefighting activities. It was later set up for deployment but the structure was evacuated prior to being deployed.

Guidance for use of CAFS (SI 0607, Page 6) states that:

"Structural Firefighting whilst using CAFS MUST only be carried out from an external position",  
and:

"There are currently no national guide lines on the use of CAFS for internal compartment firefighting."

FFFP Foam and foam making equipment was also considered as an option but due to the internal conditions, it was not deemed safe to commit crews with just a foam branch as it would have offered no protection from the fire gases that pulse firefighting provides.

MFRS crews are not trained to conduct an internal fire attack with a CAFS or foam branch.

### Action/Observation

- Observation - Selection of media was compliant with local and national guidance along with training, knowledge, skills and competency of the crews.
- Observation - Operational crews are only trained to utilise water for internal firefighting and so this was the only viable media at the incident.
- Observation – If the decision had been made to introduce a foam branch internally this would have required withdrawal of firefighting branches and have put further demand on water supplies. This would have decreased the safety of the committed crews.

- Action - Training & Development Academy to review the use, benefits and limitations of CAFS as a firefighting media for use inside structures.
- Action - Review options for deploying foam into a structure from an external position.

## 6. Firefighting Tactics

The initial tactical plan consisted of external firefighting with a hose reel, upscaling to two main branches whilst an internal attack via the dry riser was put in place. This external attack was mainly ineffective due to the design feature of the grilles mounted on the outside faces of the structure.

Internal firefighting commenced from Stair Core 2 (Sector 2) and escalated to two sectors in operation (Sector 3 in Stair Core 1) as more resources arrived on scene. BA crews reported that the fire was surrounded and Incident/Sector Commanders presumed it was contained within a concrete structure on Level 3, so did not anticipate or expect it to spread to other floors. The tactical plan was revised following a significant fire development at approximately 1825hrs. Shortly after the escalation BA teams were withdrawn from within the structure and the plan was revised to contain the fire within the car park and protect the surrounding buildings.

CPLs were not requested in the initial stages as the tactics were focussed on internal firefighting with reports from crews stating progress was being made. The grilles on the outside of the car park ruled out the use of aerial appliances to be utilised as water towers, as any jet would be dispersed and hindered by this feature.

Guidance for Firefighting in the Built Environment is given in SOP 1.1.0 (FIBE). Initial considerations include identifying water supplies and appropriate firefighting media. A further consideration is given to wind speed and direction, building construction and fire loading.

Initial crews were faced with a developing fire involving multiple vehicles in a building with open vented sides to the majority of each elevation. The initial actions and developing incident response in each instance are in line with the procedures detailed in the SOP.

Current guidance for construction of multi-storey car parks in England is sourced from Approved Document "B" (ADB). A public domain document, "The Changing Nature of Fire Risks in Car Parks" by Ian Gough on behalf of BAFSA (British Automatic Fire Sprinkler Association) states that ADB reflects post war studies, when vehicles were of a simpler construction. Today, vehicles are manufactured using plastics, polycarbonates and composite materials. Systems include air conditioning, detonators in airbags and greater fuel capacity, combined with vehicles being generally larger, with the introduction of SUV's and 4x4s. Studies also confirm that vehicles aligned into rows will produce a greater heat output than singular vehicles. One vehicle will produce up to 5MW of energy but two vehicles close together may produce between 16-20MW due to reflected heat and lack of ventilation between vehicles.

MFRS main branches heat absorption capabilities range from 20.4 – 27.2 MJ/s (1 MJ = 1 MW), Initial crews reported up to 10 vehicles involved which would release well in excess of 100 MJ/s of energy. In this scenario, a minimum of 5 - 6 main branches would have been required.

A standard dry riser has a diameter of 150mm with the capacity to supply 3 main jets. Therefore, the capacity of an individual riser was inadequate to attack a fire of this combined size and energy output along with radiated heat transfer to other vehicles and surrounding structure.

#### Action/Observation

- Observation - Several factors determined the initial internal firefighting tactics. This included the design of the building, external grilles, availability of a dry riser, etc. along with the assumption that crews were dealing with a containable fire on Level 3. All tactics were compliant with local and national guidance.
- Observation - The fire was developing exponentially as the internal firefighting tactics progressed. Following review of the heat absorption rates of cars in a confined space at close proximity, it is now considered that the available water supplies were not sufficient to absorb the heat and extinguish the fire. This was not apparent to the crews as some of the heat output was being released into Level 4 following failure of the structure. Crew knowledge and understanding presumed that the concrete structure would remain intact so the fire conditions on Level 3 gave a false impression of what was being dealt with until the escalation at 1825hrs.
- Action - Tactical Firefighting Department to explore alternative tactics and choice of media for internal firefighting in a multi storey car park.

#### 7. BA Procedures

Two Entry Control Points were in operation during the early stages of the incident; Entry Control Point Alpha (Sector 2) and Entry Control Point Bravo (Sector 3). Despite not being recorded on the incident log, it has been established that Stage 2 BA was in use, but due to focused and dynamic activity on the incident ground, the log only refers to Stage 1.

Both ECPs had a different viewpoint on how the fire was progressing due to wind direction. Internal conditions in Sector 2 were poor, with heavy smoke logging and high temperatures reported. Sector 3 had good visibility being in virtually fresh air conditions due to it being upwind of the fire.

There was no direct radio communication established between the ECPs. Pack set communications were in place across the incident ground but experiencing a high volume of traffic. This contributed to differing views of how the incident was developing.

As the incident progressed, Sector 3 commander was aware that Sector 2 had evacuated due to deteriorating internal conditions within their area of operation. He was not aware that this was also due to concerns regarding the integrity of the structure. BA teams in Sector 3 were evacuated at 1838hrs (approximately 15 minutes after Sector 2) due to deterioration of the internal conditions and failure of the structure.

MFRS has guidance in place for the use of BA in the form of National Operational Guidance BA Procedures V1.2. The demands of the incident exceeded the level of control afforded by Stage 1 BA, therefore Stage 2 was implemented from the stairwells employed in the initial internal attack. This was due to the incident having:

- More than one ECP - Sectors 2 and 3 having entry points.
- More than three BA teams being deployed into the risk area at one time.
- More than six wearers committed at any one time. 7 wearers were committed during height of operations within Sector 3.

Stage 2 BA guidance states that in addition to the Entry Control Officer, an Entry Control Point Supervisor (ECPS) and Communications Operative should be appointed.

All of the BA guidance relating to Stage 2 was implemented but due to the dynamism of the incident the effectiveness of each role was impacted.

Page 69 of the BA guidance document refers to the implementation of BA Sector Command which would be initiated once more than one Stage 2 ECP is in operation. One of the key actions of BA Sector Command is to establish a communications link between all ECPs in operation.

Full BA Sector Command was not implemented at the incident due to the speed the fire progressed although the GM had initiated the pooling of BA wearers in Sector 2 with a WM designated as a BA Sector Commander.

#### Action/Observation

- Observation – Stage 2 BA had been implemented at the incident although the detail was never entered on the log due to the ongoing escalating activity along with a lack of resource in the command support team in the initial stages.
- Observation – The dynamics and pace of the incident did not allow time to fully implement BA Sector Command as evacuation had already been instigated before this could be fully implemented as a specific sector.
- Observation - BA Sector Command procedures within MFRS were created based on a total provision of 42 appliances. The implementation requires 8 personnel, which is an additional 2 appliances. As the Service currently operates with 27 frontline appliances, the protocols for BA Sector Command require review, particularly with regards to staffing and operation.
- Observation – When BA Sector Command was introduced in the Service, crews from Birkenhead and Eccleston Fire Stations were identified as support pumps and provided with specific training. The support element has not been maintained with Birkenhead now a command support station and Eccleston transitioning to day crewing. No other crews have received the BA sector command training.
- Action – Review to be undertaken of BA Sector Command structure and who supports this at an incident.

## 8. Building Construction / Protection

The perception of the crews attending was they were fighting a fire on a single level (Level 3) within a concrete structure. Failure of or a bypassing of that structure, allowing the fire to spread to other levels, was not considered to be normal behaviour of this building type.

The wind direction did change during the incident and coupled with the open sided construction of the car park and windy conditions on the night, aided ventilation and development of the fire conditions.

The car park levels had manual break glass fire call points and the stairwells had automatic fire alarm and smoke control systems. There were no fixed installations within the car park.

Fire Service Training Manual, Volume 3, Basic Principles of Building Construction, Chapter 6, 6.5 Concrete states;

“Concrete is inherently non-combustible and may be produced having a wide range of properties... In a severe fire, spalling of the surface material occurs and is aggravated if the hot concrete is suddenly chilled, for example with a jet of water... It is possible to achieve very high levels of fire resistance with reinforced concrete, up to four hours is easily achieved.”

Building Regulations 2010, Fire Safety Approved Document B

B3 Internal Fire Spread (structure), Section 11.2 (b) (p89) Special provisions for car parks and shopping complexes – “Where the car park is well ventilated, there is a low probability of fire spread from one storey to another.”

Reports have been completed by MFRS Incident Investigation Team, The Protection Department and other Agencies, including BRE, to investigate how the structure of the car park behaved during the early stages of the fire and how this contributed to fire development and escalation.

The ceiling height and shape, proximity of parked vehicles in relation to each other and vehicles parked on ramps, floor drainage systems including aluminium guttering and plastic downpipes along with fire protection limits of concrete, are areas which have been considered within each document.

### Action/Observation

- Observation - Information from the Fire Service Training Manual and Building Regulations would support the rationale of operational personnel that the fire was likely to remain confined to Level 3.
- Observation – For further information, refer to separate report produced by MFRS Protection Department.

## 9. Aerial Appliances (CPL)

Aerial appliances were requested once the tactical plan had moved to external firefighting with three deployed into Sectors 1, 2 and 4 to prevent fire spread to the adjacent flats and assist latterly with extinguishing the fire.

The first CPL was requested at 1821hrs. M25P1 (Wallasey) was standing in at Bromborough at the time of the request and returned to Wallasey to collect CPL M25A1 prior to proceeding to the incident. The appliance booked in attendance at 1854hrs, 33mins after the original request. Travel time from home station to the incident is 14mins. The request for a CPL was not considered earlier as the initial tactical plan was based upon internal firefighting.

Make CPL's 2 was sent at 1856hrs. M33P2 (Southport) travelled to City Centre Fire Station to collect M11A1. Arrived at scene 1938hrs, 42mins after the request had been made.

At 2012hrs the 3<sup>rd</sup> CPL was requested to attend after evening change of shift at 2030hrs and mobilised at 2049hrs from Southport, arriving on scene at 2120hrs. A total of 31mins travel time from station to incident.

SI 0763 Complementary Crewing provides detail of the protocol for one pump/two pump stations and mobilising procedures. The procedures were implemented correctly.

### Action/Observation

- Observation - There is no defined attendance time for an aerial appliance.
- Action - A review of complementary crewing of CPLs is already being undertaken as part of a separate High Rise work stream within the Service.

## 10. High Volume Pump (HVP)

Three HVPs were utilised during the incident. One was set into Dukes Dock and the other two into Wapping Dock which provided the large volumes of water required to contain and finally extinguish the fire.

Merseyside HVP was requested at 1905hrs. The HVP is located at Belle Vale fire station, but Belle Vale's fire appliance was already at the incident. M22P1 (Heswall) were standing in at Bromborough at the time of the request and were assigned as the HVP support pump. M22P1 returned to Heswall to collect equipment prior to proceeding to Belle Vale. The HVP was collected and arrived on scene at 2030hrs, 1 hour 25 minutes after being requested.

Make HVPs 3 was sent at 2000hrs and were mobilised from Bolton and Burnley. Bolton's HVP arrived on scene at 2156hrs, Burnley's five minutes later. The time taken from request (for both to arrive); 2 hours 1 minute.

HVPs can take up to an hour to set up after arrival at an incident.

SI 0763 Complementary Crewing provides detail of the protocol for arrangements and mobilising procedure and SI 0451 High Volume Pump gives specific detail regarding the mobilisation and capabilities of a HVP.

Mobilising arrangements on 31<sup>st</sup> December were in line with laid down procedures which included the National Resilience request for the additional assets.

#### Action/Observation

- Observation - The HVP was not requested in the initial stages of the incident on the assumption that the fire would be contained to Level 3 and that water supplies around the site would be sufficient to deal with the incident. The requirement for a HVP only became apparent following the escalation of the fire at approximately 1825hrs and a change in firefighting tactics.
- Action - Review action plans for Fire Control to consider HVP resource at escalating incidents, e.g. prompt given at 'make pumps 6' along with ring-fencing of support pump.
- Action - Review Hose Layer and LPP Unit provision.

#### 11. Command Support

The Command Support Unit (CSU) M15C1 is a complimentary crewed asset and is staffed by a Watch Manager and three to four Firefighters. It is mobilised with a support pump and the asset is then supported on scene by a CS trained Watch Manager and crew.

On 31<sup>st</sup> December Toxteth's fire appliance was unavailable due to staffing levels so two CSU trained Firefighters from Toxteth were detailed to staff the CSU whole-time for that shift. An appliance from Kensington was stood in at Toxteth for the full shift, which is normal protocol to ensure an appliance is available from the station. Kensington are not trained operatives for the CSU.

The CSU was assigned with the "Make Pumps 6" at 1702hrs. No support appliance was sent as Fire Control understood the CSU to be whole-time staffed. This meant that on arrival at scene at 1718hrs it only had two crew members to conduct the function and did not have a designated Command Support Officer.

The CSU was set up initially at the entrance to the car park but was relocated at approx. 1825hrs due to the area becoming smoke logged. The repositioning delayed the "METHANE" message being sent. After relocating the vehicle the crew had problems with the generator which hampered access to Vision, etc. and impacted the CSU's role at the incident.

Although the CSU was having IT issues, all Senior Officers have access to Vision via iPads or laptops so this could have been utilised as a temporary measure.

The Incident Command & Control Unit (ICCU) was requested and mobilised immediately after the Major Incident was declared. This is useful for presenting information on whiteboards, providing a multi-agency meeting facility and passing radio messages but is dated and has no other IT capability.

Fire Control guidance notes & action plans advise;

*The Command Support Unit (CSU) will be mobilised to all incidents involving 4 or more appliances (not including pumps mobilised as complimentary crews) or at the request of the IC.*

The CSU and ICCU vehicles were mobilised in accordance with this protocol.

SI 0763 Complementary Crewing provides detail of the protocol and mobilising procedure for support pumps but is not specific to the CSU. The current Action Plan for the CSU in Fire Control does not detail whether a support appliance should be sent or not if the CSU is staffed whole-time. This leaves the process open to interpretation.

If a support appliance is not sent when staffed whole-time, the role of Command Support Officer would have to be undertaken by an officer at scene and additional firefighters utilised for roles within the Command Support Team. This may present issues if dealing with an escalating incident as crews will already be committed to other tasks.

#### Action/Observation

- Observation – Due to the CSU not being mobilised with a support team this impacted on the generic responsibilities aligned to the role. Example being update of incident log, issuing of tabards, fire ground audit, reliefs, etc.
- Observation – The GM when first approaching the CSU expected to have a WM and team but only two firefighters were available which limited this support function. The GM supplemented the team as the incident progressed and further resources arrived at scene.
- Observation – The Area Manager provided CS to the CFO as the incident escalated but this was at a higher level than the CSU team provide so did not replace this support function.
- Action – Review be undertaken to how the CSU is staffed and which stations/crews it is supported by to reflect Organisational and shift pattern changes.
- Action – Confirm Fire Control action plans detailing procedures to be undertaken when the CSU is staffed whole-time by two firefighters. This should include the need to mobilise a support appliance and crew to fulfil all the roles of the Command Support Team.
- Action - The Service should look to review its Command Support assets which should consider the CSU (including spare CSU) and ICCU.
- Action – As part of the review, consideration should be given to mobilising a Senior Officer to act as Command Support Officer at a large incident where the complexity and/or severity of the tasks may be outside the role and competency of a Watch Manager which requires a higher level of supervision.

#### 12. Communication Strategy

Communication was established with Fire Control via the Airwave radio system. On review of the incident log it is apparent that there is a lack of informative messages in consideration to the

scale of the incident which results in limited detail on the incident log in relation to the activity that was conducted.

The Command Team were very clear as to the incident objectives and this has been confirmed during Officer debriefs and interviews. The lack of resource in the Command Support Team in the early stages, along with the dynamic and shifting priorities of the incident, contributed to the infrequent and limited detail on the incident log.

Fire ground communications at the start of the incident were conducted on a single pack set channel but due to the amount of radio traffic the first responding GM implemented a second command channel for Senior Officers and Sector Commanders. This improved communication across the incident ground.

SI 0584 MDT and Airwaves Radio procedure details foundation guidance for operation of appliance radios/MDTs. This states that a full descriptive informative message should ideally be sent within 5 minutes of attending an incident.

Two Assistance messages were sent for 'Make Pumps 3' and 'Make Pumps 6' prior to an Informative being sent at 1717hrs. This is not unusual considering the scale of the incident and the speed at which it was progressing.

The Service Instruction also states:

*'Further informative messages should be transmitted to ensure all details, updates, change in tactics and activities etc. are recorded on the incident log and should also include confirmation of the Tactical Mode.'*

SOP 1.5 Mobilising and Communications states that informative messages should contain incident details and activity with the tactical mode sent every 20 minutes. This protocol was not followed at the incident due to issues highlighted earlier in the report.

A Methane message declaring a 'major incident' was sent at 1849hrs and correctly followed the guidance in SI 0584 and the principles of the Joint Emergency Services Interoperability Programme (JESIP).

#### Action/Observation

- Observation - The CSU had a reduced resource in the early stages of the incident which impacted the effectiveness of the asset in relation to being able to update the incident log.
- Observation - The protocol for informative messages was not followed for the duration of the incident which resulted in the activity and decision making not being recorded on the incident log.
- Action - Review the command support resource at large incidents to ensure the Incident Commander is supported by suitably qualified and experienced staff to enable decision making and incident logs to be populated to the required standard.

### 13. Crew Welfare

Debrief feedback and observations of the incident log stated that some crews were in attendance for up to 10 hours, but all welfare requirements appeared to have been met through the Level 2 provision combined with support from hotels close to the incident. The debrief log has been scrutinised and no negative observations have been received from the crews that were in attendance even with the extended deployment of some personnel. Contributors to debrief have placed on record their gratefulness to local hotels and businesses who assisted during the incident.

SI 0092 Welfare Logistics Unit provides detail of the PDA, setup and operation of the unit, currently based at Station 10 Kirkdale. Level 2 Welfare is automatically mobilised at 6 pumps or greater although the request for Welfare was not mobilised until 1810hrs, despite the 'make pumps 6' being received at 1701hrs.

A welfare area was set up in Sector 1 during the early stages of the incident. This was primarily to afford rest areas for BA Wearers to recover following internal firefighting activities.

Current procedures appear satisfactory and are reflected in the relevant SOPs.

There is no official procedure for sourcing welfare needs from third parties and it is apparent that on this occasion the goodwill of local businesses supported the Service needs.

#### Action/Observation

- Observation – Welfare provision at the incident proved effective and was in line with the Service Instruction although the initial activation was delayed due to the escalating operational demands.
- Action - It is recommended that official recognition be given to The Salvation Army and local businesses and hotels to place on record our appreciation of the assistance they provided during the course of the incident.

### 14. Safety

Due to the scale of the incident there was a high demand on resources. The aim was to place one Safety Officer (WM) in each sector but due to the demand on personnel, this resulted in one Safety Officer per two sectors (Sectors 1/4 and Sectors 2/3).

Cordons between sectors were "naturally defined" through the physical construction of the car park building and all staff working on the fire ground understood the boundaries of each Sector. The Police controlled the outer cordon as the incident developed.

The Management of the Health & Safety at Work Regulations 1999 - Regulation 3 states:

*(1) Every employer shall make a suitable and sufficient assessment of:*

*(a) The risks to the health and safety of his employees to which they are exposed whilst they are at work; and*

*(b) The risks to the health and safety of persons not in his employment arising out of or in connection with the conduct by him of his undertaking.*

SI 0042, Dynamic, Individual and Analytical Risk Assessment provides detail of each type of risk assessment, the role and responsibility of the Safety Officer and guidance on completion of the current ARA form.

It is Service procedure that ARA's will be completed within 45 minutes of the first attendance, at protracted incidents, or when engaging in high risk activities. Safety Officer(s) should be recorded on the log.

Analytical Risk Assessments (ARA) were completed to a variety of standards but none achieved what was required for the complexity of the incident. Not all forms were signed by Sector Commanders, although interviews have confirmed that verbal communication was ongoing at the incident with Safety Officers and Sector Commanders.

It has been reported during Watch Manager interviews that the Safety Officer role and subsequent records were inconsistent due to the size and pace of the incident.

Currently, supervisory managers who are detailed as Safety Officers at incidents have a minimum qualification of IOSH Managing Safely which provides a greater understanding of risk analysis.

#### Action/Observation

- Observation – The Safety Officer Role and ARA completion at the incident was not conducted to the required standard. This is a trend that has been identified by OAT at other incidents and station audits.
- Observation – Watch Managers complete an IOSH Managing Safely qualification which is generic and not specific to ARA completion.
- Observation - ARA input was provided to all Watch Managers at its inception in 2010 as an introduction to the new format. There has been no formal practical training since this input and any newly appointed Watch Managers are reliant on LearnPro to gain competency.
- Action – The ARA form is currently under review with a new template on trial at the Training and Development Academy which will assist the Safety Officer with hazard and control measure identification at future incidents. The aim is to migrate this process to an electronic platform available by tablet.
- Action - Review training provision for the role of Safety Officer and ARA completion which should capture supervisory managers that have been promoted since 2010 have received no practical input.

#### 15. Incident Command Structure (ICS)

The initial command structure comprised of two sectors that managed the BA entry points for internal firefighting. The structure expanded to four sectors once personnel had been withdrawn

from the building and the focus changed to containment of the fire to the car park and the protection of surrounding structures.

The incident escalated with the makeup of appliances and the Chief Fire Officer mobilised and took charge of the incident. An Area Manager provided command support to the CFO with a Group Manager designated as the Operational Commander.

A fifth sector was added around 0100hrs on the 1<sup>st</sup> January to capture activity within the service road leading to the Echo Arena and to prevent fire spread to this area. Station Managers were utilised to run all but one of the sectors, this being Sector 2 which had the least critical activity.

It was noted from debriefs that further Senior Officer support may have been considered for functional roles. Areas identified were USAR advisor, marshalling/logistics officer, water officer, BA sector command and command support (to run the CS team).

SI 0145 Incident Command Case provides detail on the contents and operation of the case provided on all frontline appliances.

Information received from Officer interviews suggests that only one Command and Control Case and table was set up, which was in Sector 3, although the adverse weather conditions made this provision difficult to maintain.

SOP 6.1.0 Incident Command, details the roles and responsibilities of functional officers, including tabard identification and examples of use within the ICS. Due to the Command Support team being under resourced when mobilised, not all tabards were issued to designated officers.

Watch Managers were allocated responsibility for some functional roles, however due to the scale and complexity of the incident this may have been beyond their level of competency as no formal training had been provided, e.g. Water and Safety Officer Roles.

SOP 6.1.0 section 64: The command support function will operate from the command point, which should be clearly identified; usually by the use of blue lights (in the NW region) or the use of a red flashing light or a red and white chequered flag (other regions). This guidance was not fully adhered to which led to confusion of oncoming officers and appliances.

#### Action/Observation

- Observation - A clear command structure was in place and sectorisation was in accordance with SOP 6.1.0 Incident Command.
- Action – Review training input for functional roles to inform all Managers.

#### 16. Fire Control – use of appliances, impact on other business, 13/16 arrangements

On the day shift of New Year's Eve Fire Control Red Watch had six staff on duty who were replaced by six from White Watch at 1900hrs. Further support was provided by a GM who was mobilised to the Joint Control Centre (JCC) at 1909hrs.

From the initial two pump mobilisation at 1643hrs the incident escalated to 17 appliances committed by 2049hrs. This figure includes the make-up and support pumps for complimentary

crewed assets. The 17 were drawn from 26 appliances available during the day shift on 31<sup>st</sup> December 2017, which provided 17 WM/CM and 58 Firefighters.

Appliance numbers at the incident increased with make ups for 3, 6, 8 and finally 12 pumps. The make ups were requested and achieved as stated below:

Incident make up	Time requested	Appliances on scene
Make pumps 3	1656hrs	1702hrs
Make pumps 6	1701hrs	1722hrs
Make pumps 8	1731hrs	1749hrs
Make pumps 12	1741hrs	1759hrs

At 2051hrs a 10 pump relief plus 3 x HVP and 3 x CPL along with a command support pump were requested. This totalled a 14 pump relief (10 + 3 (CPL) + 1 (CS)). Operation Poseidon was initiated at the same time which meant the Merseyside HVP became self-sufficient utilising the trained pool of HVP operators. The 14 pumps were drawn from the 28 appliances that were available on the night shift of 31<sup>st</sup> December 2017.

A request was put into North West Fire Control (NWFC) for assistance and the first over border mobilisation was Tarleton’s appliance L58P1, which stood in at Southport. NWFC supplied further appliances to assist MFRS meet operational demands.

The procedure for NWFC when asked for over border assistance on 13/16 arrangements is for a call to go to a GM from the identified County where the support is to come from. The GM then contacts MFRS Fire Control to ascertain what the appliance is to be utilised for. This delays the attendance of the appliance into Merseyside with an example being the request at 1929hrs for an appliance from Ellesmere Port to stand in at Bromborough. This request was deferred by Cheshire until 2000hrs when the night crew came on duty.

There were also issues with NWFC swapping out appliances committed to stand in at MFRS fire stations without informing Fire Control. When an over border resource is brought into Merseyside, this requires an appliance to be created within the MFRS Vision mobilising system. If this appliance is then swapped out by NWFC without informing MFRS Fire Control, it results in an issue if mobilised to an incident, as the mobilised appliance will have left the County and the replacement appliance is an unknown in the mobilising software.

From the time of the initial call to 0800hrs the following morning, MFRS Fire Control dealt with a further 28 operational incidents and subsequent mobilisations, alongside the Kings Dock commitments.

Overall, 53 appliances of various types were mobilised to the Kings Dock incident between 1643hrs 31<sup>st</sup> December, 2017 and 0800hrs 1<sup>st</sup> January, 2018. 46 standby moves were also managed in this period with 16 appliances brought into the system through 13/16 arrangements, some of which were utilised at the incident.

There were only six 999 calls to Fire Control related to the Kings Dock incident in the early stages. Part of the event planning and risk assessment, a small private fire team were present due to the additional fire loading posed by the stabling, straw, hay, etc. on the bottom floor of the car park. The Fire Event Team were on scene upon arrival of the first MFRS fire appliance and car park CCTV shows them arriving at the car park main entrance after being mobilised from the LGV car park. A possible reason for the low number of calls to Fire Control may be that this created the impression that the Fire and Rescue Service were already in attendance. (See Timeline image, Page 9).

SOP 1.5 Mobilising and Communications, Section 3.11 (extraordinary mobilising) gives detail of spate conditions and mutual assistance and The Fire & Rescue Services Act 2004 Section 13/16 (1) states that 'A fire and rescue authority must, so far as practicable, enter into a reinforcement scheme with other fire and rescue authorities'.

These arrangements were utilised by MFRS Fire Control to request fire appliances to maintain fire cover within Merseyside and further appliances later into the incident to relieve crews already in attendance.

#### Action/Observation

- Observation - Fire Control performed exceptionally well in dealing with the high volume of activity associated with the incident.
- Action - Review with NWFC procedure for initiating 13/16 arrangements, to include improved communication when reliefs take place.

#### 17. SCG/TCG/Multi-Agency Meetings

Regular multi-agency meetings took place on site during the incident.

A major incident was declared at 1849hrs which instigated the major incident action plan.

The Chief Fire Officer was committed to the incident so an Area Manager (AM) was mobilised at 2023hrs to attend a Tactical Co-ordinating Group (TCG) at the JCC. Normal out of hour protocol would also mobilise a Station Manager to open up the Operational Support Room (OSR) and assist the AM. This protocol is captured in SI 0076 Operational Support Room but due to the complexity of the incident, all available SM's had been mobilised to the incident or were providing cover in the County so no support was available for the Area Manager.

SOP 1.4b Incident Command - defines a major incident as:

"An event or situation, with a range of serious consequences, which requires special arrangements to be implemented by one or more emergency responder agencies".

The Kings Dock incident aligns with the definition of a major incident in SOP 1.4b therefore this declaration was the correct course of action.

No Strategic Co-ordinating Group (SCG) was held, although Police stated during the Multi-Agency debrief that it was offered but declined by partner agencies. It was not established during the debrief who declined this offer.

Feedback received from the Multi-Agency Debrief also stated that with no SCG it caused a breakdown in the chain of command and created issues on the night. It was felt that key people were located in the wrong place. It was understood by some Agencies at the debrief that the SCG was mandatory once a major incident was declared.

The Merseyside Emergency Response Manual (MERM) 2015 states its aims and objectives as the following:

*'The aim of this Merseyside Resilience Forum (MRF) Manual is to set out the response arrangements of agencies who are Category 1 and 2 Responders, as defined in the Civil Contingencies Act 2004 (CCA), to an emergency or other incident that requires multi-agency co-ordination at any one or any combination of Operational, Tactical and Strategic levels.'*

The MERM states how agencies will respond to an 'emergency' as defined by the Civil Contingencies Act (CAA) or 'any other significant incident or event'.

The definition of the various categories of incident as set out in paragraph 2.1.1 of the MERM would place the Kings Dock incident under 'any other significant incident or event'.

Paragraph 2.3.6 states:

*'If a TCG has been formed, consideration should be given to the formation of a SCG specifically where this would add value, rather than as a routine. Although members of the TCG will be briefing senior staff within their own organisation, the Chair of the TCG should consider whether it is prudent to make a request for a SCG to be activated.'*

The statement of 'where this would add value, rather than as a routine' in relation to a formation of a SCG signifies that actions on the night were within the guidance of the MERM. The OAT have not been able to identify any guidance within the MERM were an SCG is mandatory with the exception of pre-arranged emergency plans such as declaration of 'cloudburst' related to a COMAH incident.

North West Ambulance Service (NWAS) stated during the multi-agency debrief that they were only informed of the incident by St Johns Ambulance who are contracted to the Echo Arena to provide medical cover during events. This was initiated by the NWAS Tactical Commander, who was coincidentally mobilised as a lead clinician to reports of an asthmatic patient at the scene. The NWAS Tactical Commander attended at approximately 1900hrs.

As a major incident was declared at 1849hrs, the action plan had been initiated by Fire Control, who proceeded to inform the relevant agencies. NWAS were formally notified by Fire Control at 1902hrs. Fire Control were unaware that the NWAS Tactical Commander was already in attendance.

The confirmed protocol between St Johns Ambulance and NWAS is that NWAS will only be informed if the St Johns Ambulance resource becomes overwhelmed or require personnel for assistance. This is at the discretion of the Operations Commander for St Johns Ambulance, who will assume responsibility for assets and personnel at planned events.

Information regarding ambulance actions and patient numbers at approximately 1900hrs was not relayed to the TCG, which took place over one and a half hours later. NWAS was represented at the meeting. This information had also not been exchanged at the incident during multi agency meetings.

#### Action/Observation

- Observation – TCG activation was as per the guidance within the MERM.
- Observation – No communication took place between St Johns Ambulance and the Fire and Rescue Service at the incident regarding injury to the public.
- Observation - The passage of information regarding patients was not communicated from NWAS and subsequently did not appear on the Fire and Rescue Service Vision log or provided to the AM to discuss at the TCG.
- Action - Ops Planning to consider how a refresh of knowledge can be shared with Merseyside Resilience Forum in relation to TCG and SCG activation procedures e.g. SCG is not a mandatory action for a major incident.
- Action - An action was already in progress prior to this incident to identify Watch Managers who may be recalled to staff the OSR and provide necessary support during a serious event/major incident. Observations from the Kings Dock incident supports this action.

#### 18. Relief strategy

The initial call to the incident was at 1643hrs therefore reliefs were considered due to the shift change at 2030hrs. Of the initial 17 attending appliances, ten were from 12/12 duty system, four Day Crewing, two LLAR and one 24hrs.

A 10 pump relief was requested at 2051hrs which was achieved through a combination of relief crews attending in station cars, appliances mobilised to scene or leaving retained appliances already at the incident in situ and activating their retained period.

Due to the dynamics of the incident and issues with Command Support Team resource highlighted earlier in the report, the management of the relief changeover at scene proved challenging.

SI 0860 Welfare and Rehabilitation at Incidents provides guidance around relief strategy for operational managers and Fire Control.

Current procedure makes provision of a Service station vehicle in the absence of or involvement of an appliance at the incident and this proved beneficial on the night due to appliances still being required to provide cover elsewhere in the County.

With the introduction of station cars to assist with the relief strategy, the process of declaring 'relief is effected' on the incident log has been lost with some staff. In reviewing the incident this has identified that Watch Managers have not been swapped over on the log as the appliance has remained in attendance, which makes the log inaccurate and could hinder a role call if required.

Appliances remaining on scene and not returning as part of the relief resulted in the extensive use of the fuel bowser which was eventually depleted. This led to an issue as there is no formal procedure to replenish fuel tanks whilst still engaged in an operational incident.

#### Action/Observation

- Observation - Due to the scale of the incident and number of appliances involved, implementing the relief strategy proved challenging.
- Action - Review functional roles at incidents to provide individuals for managing reliefs, marshalling, logistics, etc.
- Action - Review relief strategy when utilising service vehicles to move crews rather than swapping out appliances, to ensure OIC informs Fire Control that the relief has taken place and provide the name so the incident log reflects the structure at the incident.
- Action - Review the current arrangements for replenishment of the fuel bowser whilst still engaged at an operational incident. This may link to action in section 2 for Senior Managers to utilise corporate credit cards.

#### 19. Senior Officer Recall

A Senior Officer recall was activated at 1957hrs with 4 Station Managers and 2 Group Managers responding. 3 SMs and 1 GM were utilised.

All activated Officers were immediately placed onto cover and mobilised to Kings Dock as reliefs at 0200hrs on 1<sup>st</sup> January 2018.

SI 0441 Recall to Duty states:

*'Recall to duty will be a voluntary facility to supplement the operational needs of the Service at times of serious or protracted incidents' and 'Control will use a paging or alerter facility to recall appropriate personnel.'*

The procedure on the night of the incident provided sufficient numbers to supplement the flexi cover and relief requirement.

#### Action/Observation

- Observation – The recall protocol provided sufficient officer numbers on the night of the incident.
- Action - The current recall protocol for Senior Officers places a reliance on a voluntary response and individual availability as to how many managers respond. The Service is to review this strategy to ensure it provides sufficient resilience to the Senior Officer team.

## 20. Repatriation of equipment, post incident considerations

The procedure for repatriation of equipment is to complete a FB5 form identifying missing equipment prior to leaving the incident, which is given to the Incident Commander or Command Support Team. This procedure was only followed by one appliance during the incident.

The Incident Commander on the morning of 1<sup>st</sup> January arranged for all surplus equipment to be gathered from the incident ground and transported to Kirkdale Fire Station for repatriation.

Observations also identified relief crews having equipment removed from their appliances to supplement fire appliances that were leaving the incident. This may be better managed by crews swapping on to appliances bringing in relief crews which are already fully kitted.

Consideration needs to be given to fuel levels of vehicles remaining at scene.

The non-mobile store at Vesty Road had some access issues and the contents of the store was depleted of equipment/fire kit stocks, due to the high demand placed on it.

Current procedures are detailed in:

SI 0258 Repatriation of Equipment, states the role and responsibility of the Incident Commander, the closing appliance manager, the Equipment Recovery Officer (if appointed) and guidance on completion of FB5/FB7 forms. The SI places responsibility on the Incident Commander in the closing stages to request a courier through Fire Control. This was carried out at 1739hrs on 1<sup>st</sup> January and at 1138hrs on 2<sup>nd</sup> January.

### Action/Observation

- Action – Review current guidance with consideration given to surplus equipment being taken to a particular location for crews to retrieve and repatriate.
- Action – Update SI 0860 Welfare and Rehabilitation at Incidents to include appliance fuel level as an early consideration when station cars are used as part of a relief strategy

## Fire Progression

Fire Investigation activities began at the Kings Dock Car Park at 1822hrs on 31<sup>st</sup> December with the attendance of the MFRS Incident Investigation Team (IIT). The IIT Officer has worked with officers from Protection and Operational Assurance to ascertain how the incident started and developed and what actions were taken and the issues faced by operational personnel.

From initial observations, CCTV and Social Media sources it could be seen that the fire once sufficiently developed moved rapidly up through the structure. Early thoughts around this highlighted vehicles being parked on the ramps between floors as a possible factor in fire spread.



Once initial crews and officers were de-briefed it became apparent that the fire, prior to evacuation and cessation of internal firefighting was confined and surrounded to the second and third rows of Level 3. This therefore ruled out the ramps as the initial reason for the fire spreading upwards.

Next it was considered whether the failure of the concrete structure itself had been a major factor in fire spread. BA teams and personnel externally, reported spalling or exploding concrete, with BA teams identifying holes in the floor above or seeing debris falling down. Later BA teams also reported ignited fuel running down like a waterfall from the floor above.

Images obtained by IIT show severe failure of the concrete floors.



The investigation has shown a drainage system built into the car park floor to take away any excess surface water. The drainage systems vary on different parts of the floor level, i.e. the drains adjacent to the ramps are different to those adjacent to where the car that first ignited was situated. This is an area also highlighted within the MFRS Protection Report and is considered as a cause of fire spread between floors.

The image below shows a view of the drainage slot from above.



This drainage slot runs between columns with two rows of three cars parked between each column. The drawing below shows the shape of the slot and the guttering below.

Extract from Level 2 Structural GA drawing 04248/15

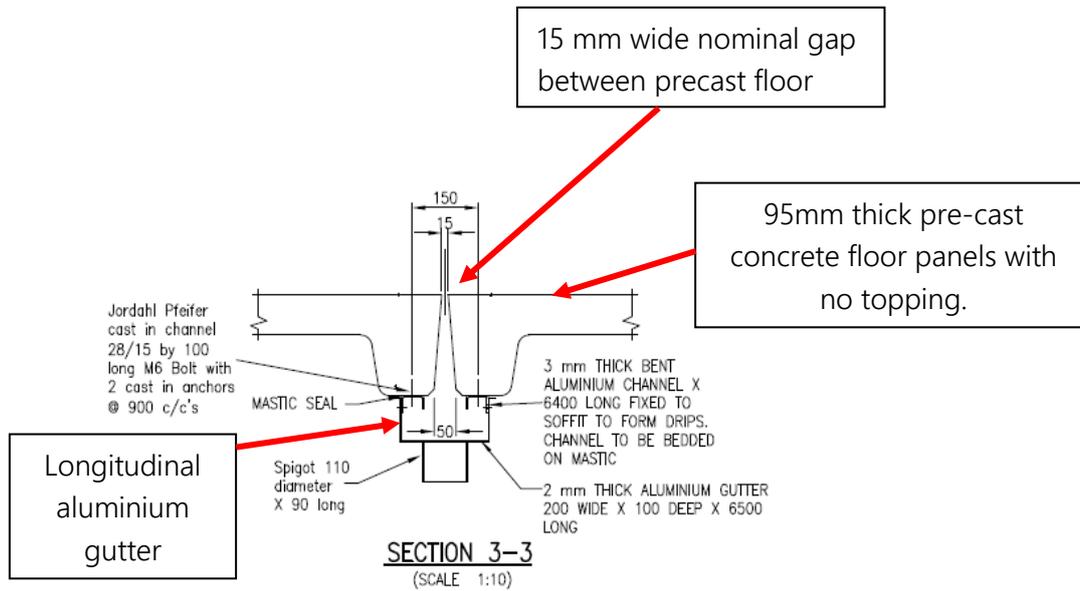


Image below shows a section of aluminium guttering in place.



See image on next page.

The image below shows a close up of a section of the aluminium guttering still in situ. The design provides a hole in the guttering where a plastic downpipe would have carried surface water out of the guttering. There is also a hole in the concrete column which the downpipe may have run into or the adjacent guttering from the other side of the column would have come through the column at this point.

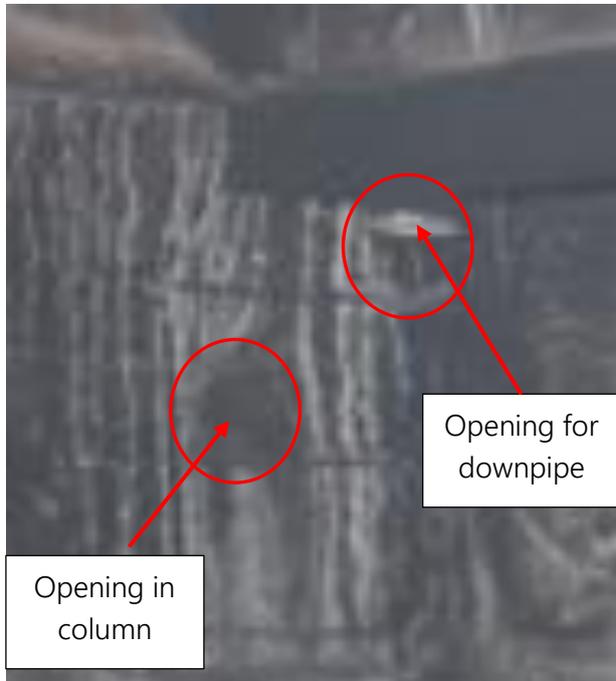


Image with downpipe still in situ

The plastic pipework and/or the guttering is likely to have failed, allowing the travel of heat and flame upwards and allowing running fuel fires to run back down to the floor below.

The image below shows an intensity of fire and heat in the lower floors where compartmentation is possibly breached, whether by effects of fire and heat on the concrete or possibly due to the drainage design.



From the evidence gathered it is likely that the construction of the drainage system and subsequent failure at the high temperatures during the fire, contributed to the fire spreading above and below the level of origin.

BRE have also produced a report stating their findings to the Kings Dock fire which is titled;  
Multi-Storey car park, Liverpool, Merseyside, 31<sup>st</sup> December 2017 - P101846-1048 Issue: 1

## Other Car Park Fire Incidents - UK and Overseas

Vehicle fires in multi-storey car park facilities have been reported in local, national and international media.

A summary of these incidents is shown below:

### Fleming Way, Wiltshire, 29/01/18

Multi-storey car park, attached to local shopping centre, three crews dispatched to tackle a vehicle fire on the third floor, suspected to have been deliberately ignited.

### Topp Way, Bolton, 20/01/18

Multi-storey car park, single vehicle fire within the multi-storey car park. Firefighters using one main jet on scene for 1 hour, recorded as an accidental fire.

### Paris, France, 10/01/18

Fire in underground car park, 1 Firefighter fatality (heart attack), 120 Firefighters attended.

### Jecheon, South Korea, 20/12/17

Fire in a ground floor car park spread to the floors above in an eight storey building. 29 people were killed.

### Boomtown Festival Fire, Hampshire, 12/8/16

Open car park on a straw stubble field. 92 vehicles involved in fire.

### Southwater, Telford, Shropshire, 20/6/16

Multi-storey car park, fire involving several vehicles causing damage to wiring, electrical fittings and surrounding structures on the third floor. 3 appliances dispatched, using BA and one main jet brought the fire under control within 2 hours.

### Cheltenham Rd, Harrogate, 4/12/15

Multi-storey car park, vehicle fire on 5<sup>th</sup> floor, 4 appliances dispatched and one aerial ladder platform due to the position of the fire. Crews used 1 dry powder and 1 carbon dioxide extinguisher to resolve the incident.

### Isle of Wight, Newport town centre, 17/7/15

Multi-storey car park, one car involved, crews hauled up a hose reel to extinguish the vehicle, fire investigation concluded as accidental ignition.

### Willow Place Shopping Centre, Corby, Teeside, 30/12/14

Multi-storey car park building, several vehicles involved, damage to the car park structure and several retail outlets. 6 appliances attended, 30 firefighters worked for four hours to extinguish the fire. 4 youths aged between 14 and 20 charged with arson in connection with the incident.

Place Vendome, Paris, 2012

Underground car park, 40 high performance and luxury vehicles lost in fire, declared as accidental ignition due to electrical fault.

Ivry-sur-Seine, France, 2009

Multi-storey car park, 200 vehicles involved in fire, fifteen appliances engaged, use of aerial appliances as water towers.

Foregate Shopping Centre, Kilmarnock 26/12/08

Multi-storey car park, fire on the third level with heat and smoke travel up to the fourth and fifth levels. 2 BA teams deployed, a total of 11 vehicles damaged, fire investigators found the cause to be accidental.

Monica Wills House, Bristol, England, 2006

Multi-storey car park, fire involving 22 vehicles, one fatality due to smoke inhalation from occupancy above the parking facility.

Gretchenbach, Switzerland, 2004

Underground multi-storey car park, fire involving up to one hundred vehicles, 7 firefighters killed during firefighting operations.

## Conclusion

This incident was undoubtedly one of the largest and most challenging that Merseyside Fire & Rescue Service has faced in many years.

The potential of a severe fire spreading quickly to adjacent vehicles in a multi storey car park at near capacity as happened at the Kings Dock Car Park fire on 31<sup>st</sup> December 2017 had been identified in a BRE report in 2010. Scientific studies have proven that the heat output from a multiple vehicle fire will develop exponentially and for the Kings Dock incident it resulted in a fire that quickly developed beyond the flow rate that could be achieved from the dry risers and branch capacity of the initial fire attack.

Observations from Incident Commanders and fire crews in the early stages of the incident were that the tactics employed were having a positive impact on the fire and although the expectation was that the incident would be protracted, it was anticipated that the fire would be extinguished and confined to Level 3. This opinion was supported by feedback from crews inside the car park that the fire had been contained to approximately 20/30 cars within two rows.

The car park structure was open sided, well ventilated and met all the standards set within Building Regulations. Experience and training literature referencing fires in concrete structures supported the opinion of the initial Commanders at the incident that the fire would be extinguished if it could be contained to the third level.

An escalation of the fire occurred at approximately 1825hrs that resulted in a phased evacuation of breathing apparatus crews conducting internal firefighting operations over the following 20 minutes due to the deteriorating conditions inside the car park. This escalation is presumed to have occurred due to a significant failure of the concrete ceiling on Level 3 as a result of the intensity of the fire. It is also thought that the design of the plastic and aluminium drainage channels, along with the drainage gap in the concrete floors, had allowed flame and heat to penetrate the upper floor ahead of the failure of the concrete. This vertical venting allowed the fire to spread to vehicles on the upper level unbeknown to the crews on Level 3. Running fuel fires also contributed to the fire spread with the gradient of the floor and drainage system spreading ignited fuel horizontally and to the lower floor.

Following the escalation, the fire had progressed beyond the firefighting capabilities available at that time and the focus changed to containing the fire to the car park and protecting the adjacent structures, with the building separation on two sides being only between five and seven metres. The actions of Officers and fire crews ensured the fire was limited to the car park with only superficial damage to surrounding properties.

The BRE Report in 2010 identified the possibility of a Kings Dock Car Park type fire occurring. The conclusion states;

*'The ease with which a car fire in a car park might spread to nearby cars has been demonstrated. Once a very severe fire has developed, fire will spread to other cars separated by an un-filled parking bay.'*

This was certainly the case at this incident with the intensity and fire growth escalating at a faster rate than could be suppressed with the available resources.

The Operational Assurance Team conclude from this Significant Incident Report that although there is learning which the Service will reflect upon, overall the tactical plan and activities implemented at this incident are consistent with current Service procedures and guidelines.

Annex A

Debrief Module in OSHENS – Organisational/Team/Individual Learning

A local MFRS debrief was created for the incident on the OSHENS electronic recording database, inviting attending officers to provide a response, following discussions with attending crews.

The debrief is;

Inc. 033394 31/12/17 Debrief 002916, a total of 111 debrief responses were received and analysed by the OAT. For manageability of the document, responses relating to similar issues are grouped together.

Team/Individual Learning		
Issue	Actions	Outcomes
6 comments were received regarding smoke exposure and the use of respirators to attempt to mitigate the inhalation of products of combustion.	Sundstrom respirators issued to operational crews only have a filter which provides protection against airborne particles only and not against gases, fumes or vapours. A review of alternative measures is required including minimising smoke exposure,, staying upwind, , issue of gas filters to Ops personnel, etc.	Communication to crews regarding use of respirators and suitability at incidents provided on OBN #35. Production of OBN to reinforce siting of appliances/units at fire ground and minimising smoke exposure wherever possible.
4 comments were received regarding the relief strategy in that a crew responding in a service vehicle have no formal means of communication with Fire Control in the event of an accident/breakdown.	Cost implication of providing mobile phones to each Service vehicle against reliance of CM/WM to have contact for Control on personal mobile phones.	Ops Intel / Fire Control to form strategy for taking contact details for OIC when allocating reliefs by service vehicle. To be communicated to CM/WM.

<p>4 comments were received regarding CSU training and allocation of duties at an incident of similar size and scale.</p>	<p>A CSU training needs analysis to be carried out as skills may require refreshment or upgrading.</p>	<p>TDA Command Dept and Stn 15 to analyse individual skillsets and develop / prioritise expired training.</p>
<p>3 comments were received regarding the understanding of crews and ICS. This included recognition of roles/responsibilities and tabard identification.</p>	<p>SOP 6.1.0 Incident Command details the roles and responsibilities for ICS and provides sufficient information for crews to recognise commanders on the fire ground.</p>	<p>Crews to be locally signposted/trained by CM/WMs to study the SOP. Investigation into if TDA Command input is required to be established. Station daily audit theme, Oct – Dec 2017 included ICS content. CSU to be issued with laminated sheets detailing roles and responsibilities of functional officers within ICS.</p>
<p>3 comments were received regarding the use of CAFS internally and through ground monitors/CPL monitors. Some crews were unaware of uses other than CAFS branch application.</p>	<p>CAFS is designed to be used in a variety of circumstances and through several different modes of delivery. Communication required to crews to improve knowledge and effective operation at incidents.</p>	<p>Use of CAFS through ground monitors/CPL monitors to be communicated to crews through an OBN. Tests are to be undertaken at the TDA using CAFS in various situations and the outcomes will be monitored and communicated afterwards.</p>
<p>6 comments were received around the mobilising arrangements for the HVP and potential to omit support appliances from larger incidents. An observation was made regarding addition of the HVP to the PDA for incidents which are in close</p>	<p>The current HVP crewing system is designed to be operated by 5 personnel. Enquiries into the staffing levels at HVP support stations need initiating. A review of the approach to mobilisation or PDA should also be investigated.</p>	<p>TRM to monitor HVP support stations for satisfactory staffing levels. Ops Planning/Fire Control to investigate potential for adding HVP to PDA or providing a pre-alert. Operational demands may not allow for withholding of</p>

proximity to a large body of water.		appliances for “potential” deployment.
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Organisational Learning		
Issue	Actions	Outcomes
2 comments were received regarding the Senior Officer recall to duty system stating that a high demand incident may leave the organisation with a reduced level of SM cover	Review of recall to duty and mobilising arrangements of senior officer group to confirm suitability and areas for improvement.	
5 Comments were received regarding CPL cover. This included number of drivers, particularly an issue across White watch, the separation of a mobilised support pump creating a delayed response and the potential to employ aerial drones for reconnaissance purposes.	Review of staffing of aerial appliance and number of operators/drivers across the four whole-time watches. MFRS to consider cost/benefit of drone equipment and training needs/cover required.	TRM to investigate staffing levels across 4 watches and likelihood of watch balancing measures versus skill sets of current staff. Consider options to provide ICs with skill sets of crews at an incident to assist with rotation of crews. OET to investigate viability and cost/benefit of drone facility.
2 comments were received regarding the misinterpretation of the Fire Service evacuation signal (Acme Thunderer) by Police and other agencies.	JESIP programme details the communication/co-ordination element of the multi-agency approach.	SPoC for Police and NWS to recommunicate MFRS evacuation signal to responding agencies.

<p>2 comments were received and 4 others alluded to poor water supplies through the on-site hydrants. Initial Water Officer identified several hydrants not published on the MDT overlay.</p>	<p>Provide crews with improved MDT mapping of water mains (size and location) and fire hydrants.</p>	<p>MFRS Applications Manager has provided details of improvement and estimates product to "go live" mid-March 2018.</p>
<p>3 comments were received regarding the CSU initial attendance. These included the staffing of the appliance, training needs for crew and failure of equipment/lack of sundries.</p>	<p>Staffing level of CSU to be reviewed as a minimum, crew training to be refreshed and upskilled if required. Appliance to undergo regular inspections for readiness and responsible WMs to ensure appliance is suitably stocked.</p>	<p>Staffing review of CSU already underway. TDA &amp; Stn 15 to carry out refresher training of staff with a view to skill continuity/appliance disposition. Recurring vehicle faults to be chased up and rectified by Workshops / Telent. WMs Stn15 to be reminded to maintain consumable supplies on CSU.</p>
<p>3 comments were received regarding the Analytical Risk Assessments carried out during the incident. Initial observations suggested that the original WM ARA was inadequate due to the size and scale of the incident and that an ARA team would have been more appropriate. Comment was received with regards to the discontinuation of the ARA book in favour of a hand held tablet.</p>	<p>ARA format is currently under review and work is progressing towards a transition to a hand held device. Clarity needs reinforcing to crews as to who can carry out an ARA, the fundamental basics of carrying out the process and the recording of details (paper and electronic).</p>	<p>Health and Safety Dept to maintain progress towards the transition to an electronic medium with a new, more user friendly format.</p>

<p>6 comments were received regarding Welfare facilities. This included the discontinuation of subsistence at 02:00hrs, rest/toilet facility improvement and concerns regarding the relief strategy. Praise was given for local hotels/businesses for support during the incident.</p>	<p>Welfare and Rehabilitation SOP in place, relief strategy for incident to be reviewed by Ops Assurance Team (OAT).  High demand invoked 13/16 arrangements which proved effective in assisting at incident and staffing MFRS stations.</p>	<p>OAT to co-ordinate investigation to identify areas for improvement with regards to relief strategy. Corporate Communications to acknowledge support provided by Salvation Army and local hotels and businesses. Welfare Unit at Station 10 to be maintained by WMs for consumables.</p>
<p>3 comments were received regarding the absence of a specific SSRI for the car park building.</p>	<p>A current and valid SSRI is in place for the Liverpool Echo Arena, this only refers to the car park for the purposes of substation access/electrical isolation. A waterfront SSRI is in place for water rescues and access.</p>	<p>Ops Planning to drive a review of detail of high risk/profile SSRI and improvement to be made to Waterfront SSRI with regards to access for HVPs, open water pumping and water rescue operations.</p>

Notable Good Practice		
Issue	Actions	Outcomes
<p>10 comments were received regarding the identification of risks, particularly with regards to the use of BA, PPE and control measures. A Council building surveyor attended and provided information on the behaviour of the</p>	<p>Risk awareness within the Service raised by SPA, Health and Safety culture and training has actively contributed to the incident being resolved without injury. A statement to be provided acknowledging professionalism and discipline throughout.</p>	<p>No injuries reported during course of incident.</p>

structure and possible collapse.		
7 comments were received regarding the welfare provision made by the Salvation Army, Pullman Hotel, Jury's Inn and Tesco. These comments were positive and appreciative of the shelter, refreshments and facilities afforded to attending personnel.	Service to formally recognise the contribution and assistance of local businesses and Salvation Army.	
6 comments were received regarding the good standard of briefings and communication. 3 of these also highlighted the Sector structure used at the incident and how this assisted management of the fire ground as a whole.	Review organisational understanding of SOP 6.1.0 Incident Command.	Organisational understanding of SOP 6.1.0 Incident Command is of a suitable standard and reflected by the professionalism of attending IC's.
5 comments identified good practise in relation to ICS. The use of an Ops Commander function was highlighted.	Review of incident and alignment to SOP 6.1.0 Incident Command. Sector/Ops Commanders.	Acknowledgement of good practise to be communicated to Ops Commander/Sector Commanders.
5 comments were received on the efforts of crews to restrict fire spread to adjacent buildings. It was noted that crews worked in arduous conditions and utilised equipment	Acknowledgement to be communicated to attending crews.	CFO has issued email acknowledging crew efforts.

including the CPL to achieve this.		
2 comments noted the clearance of residential blocks by attending crews. Praise was given for the speed and efficiency in which this was carried out.	Acknowledgement to be passed to crews once identified through debriefing.	Refer to CFO email acknowledgement above.
2 comments gave note of the actions involved securing the water supply and the work that crews carried out in order to achieve this.	Multiple crews involved in establishing water supplies, to be acknowledged. A work stream is in place to create an improved water mains mapping facility available on appliance MDTs.	CFO email issued praising efforts and MDT Hydrant Overlay ready for release to appliance MDTs.

Annex B

Glossary of Terms

Section 13/16:	Mutual aid arrangement for cross border reinforcement/support between Fire & Rescue Services capture within the Fire Services Act 2004.
ACCL:	Arena and Convention Centre Liverpool
ADB:	Approved Document B (Building Regulations)
Aerial Appliance:	Appliance with hydraulic booms and cage, capable of providing a high working platform (see CPL)
Airwaves:	Communication system employed for main scheme radio by MFRS
AM:	Area Manager
ARA:	Analytical Risk Assessment
BA:	Breathing Apparatus
BAFSA:	British Automatic Fire Sprinkler Association
BA Sector Command:	Highest level of BA control
BA Telemetry:	Wireless link from BA wearer to BA board
Board Evacuation:	Evacuation of all BA wearers using Merlin Telemetry Board
BRE:	Building Research Establishment
Bridgehead:	Staging post at high rise incidents for the deployment of BA teams
BS:	British Standard
CAFS:	Compressed Air Foam System
CCA:	Civil Contingencies Act
CCTV:	Closed Circuit Television
CFO:	Chief Fire Officer
Cleveland Roll:	Hose coiling technique for high rise firefighting
CM:	Crew Manager

Command Support:	Functional role under ICS
CPL:	Combined Platform Ladder (see Aerial Appliance)
CS:	Command Support
CST:	Command Support Team
CSU:	Command Support Unit
Dry Riser:	Pipeline fitted within a building for water provision to upper floors in buildings above 18m
ECP:	Entry Control Point (denoted as Alpha, Bravo, etc.)
ECPS:	Entry Control Point Supervisor
EWS:	Emergency water supply
External Handover:	Formal exchange of responsibility from Fire & Rescue Service to other agencies/responsible persons/owners
GM:	Group Manager
Ground Monitor:	Portable water delivery nozzle
FF:	Firefighter
FFFP:	Film Forming Fluoroprotein (foam)
FF Media:	Selection of medium for firefighting, water/foam, etc.
FiBe:	Fires in the Built Environment
Fire Control:	Control room serving MFRS
Fire Loading:	Calorific value of energy released according to contents of a compartment
Hose Layer:	Fire appliance carrying large diameter hose
HVP:	High Volume Pump
IC:	Incident Commander
ICCU:	Incident Command and Control Unit
ICS:	Incident Command System
IIT:	Incident Investigation Team
JESIP:	Joint Emergency Services Interoperability Principles
LCC:	Liverpool City Council

LLAR:	Low Level of Activity & Risk
LPP:	Light Portable Pump
Main Jet/Branch:	Hose line consisting of 52mm or 70mm diameter hose
Make pumps....:	Request for additional fire appliances
MDT:	Mobile Data Terminal
Merlin Board:	Entry Control Board for BA
MERM:	Merseyside Emergency Response Manual
METHANE:	Mnemonic for major incident message
MJ:	Si Unit of energy Mega Joule
MW:	Si Unit of power Mega Watt
NOG:	National Operational Guidance
NWAS:	North West Ambulance Service
NWFC:	North West Fire Control
OA:	Operational Assurance
OAT:	Operational Assurance Team
OBN:	Officers Briefing Note
OET:	Operational Equipment Team
OIC:	Officer in Charge
Open Water:	Fire & Rescue Service term for sourcing water from a large or open source such as a river, pond or dock
Operational Info Centre:	MFRS database of SSRI information
Operational Planning:	Planning department within MFRS
Operations Commander:	Functional role under ICS
Overrun:	Demand for water outweighing supply
Packset:	Hand held radio
PDA:	Pre-determined attendance
PEB:	Public Events Briefings
PEB1:	Form used for the notice of public events

Persons Reported:	Response information indicating that persons are reported missing/trapped at fire incidents
Safety Officer:	Functional role under ICS
SCG:	Strategic Co-ordinating Group
Sector:	Area of incident allocated for greater control
Senior Officer:	Rank of Station Manager or higher
SI:	Service Instruction
SM:	Station Manager
SOP:	Standard Operating Procedure
Spalling:	To split or cause to split into fragments (e.g. explosive failure of concrete)
SPoC:	Single Point of Contact
SSRI:	Site Specific Risk Information
SUV:	Sports Utility Vehicle
TCG:	Tactical Co-ordinating Group
TDA:	MFRS Training and Development Academy
TRM:	Time and Resource Management
USAR:	Urban Search and Rescue
UU:	United Utilities (water supplier)
Vision:	(Vision Boss) Incident logging system used by MFRS
Water Officer:	Functional role under ICS
Water Relay:	Process of delivering water between intermediate appliances across an extended distance
Water Tower:	CPL used for delivering water only from its cage mounted monitor
WM:	Watch Manager

Annex C

