Table 1 : Detailed consolidated response to Caltex concerns in their submission July 2020

Details of the submission	***Details of the response to Caltex July 2020 submission***
Subject: Caltex Submission in Response to City of Newcastle Notice of Proposed Amended Development DA2017/01338	**Subject:** Caltex Submission in Response to City of Newcastle Notice of Proposed Amended Development DA2017/01338
Date of Caltex submission: 8 July 2020	**Date of response:** 1 October 2020
Addressed to: Manager Regulatory Planning & Assessment, City of Newcastle	**Addressed to:** Manager Regulatory Planning & Assessment, City of Newcastle

Item	Responder	Location	Caltex comment	Response	Open / Closed
1	Applicant	Exec summary and Para 4.1 in Caltex submission	*Exec Summary: The proposed development is non-compliant with the objectives and permitted activities for the designated IN2 'Light industrial' land use zoning as described in the Newcastle LEP 2012.* *4.1 Non-compliance to permitted activities for IN2 Zoned Land use*	The DA seeks to utilise the heritage conservation incentive provisions under Clause 5.10(10) of Newcastle LEP 2012. These provisions effectively set aside the zoning provisions applying to the site, subject to certain matters the consent authority is to be satisfied under Clause 5.10(10).	Closed.
2	Applicant	Exec summary and Para 4.2 in Caltex submission	*Exec Summary: A significant portion of the proposed development does not comply with the pre-requisites for any Heritage exemption that may be sought* *4.2 Applicability of Heritage Conservation exemption to the proposed development*	The heritage incentive incentives apply to "a building that is a heritage item or…the land on which such a building is erected…". In no respect does the proposal not comply with the "pre-requisites" provided under Clause 7.10(10).	Closed.
3	Planager	Exec summary and Paras 5.1 and 5.2 in Caltex submission	*Exec Summary: The proposed development is inconsistent with land use planning decision guidance developed in other regulatory jurisdictions. Decision guidance from other highly credible regulatory jurisdictions would recommend against the development proceeding.* *5. Inconsistency with adopted land use planning practices in other jurisdictions implemented as a result of lessons learned from major accidents* *5.1 Australian Jurisdictions – Developments in*	Caltex cites 'other regulatory jurisdictions" in their submission. In Planager's understanding, land use planning guidance developed in other jurisdictions does not form part of the "formal" land use safety planning framework in NSW. HIPAP No 10 lists the criteria for development in the vicinity of potentially hazardous facilities and this is the formal framework which is	Caltex's comment does not fall under formal land use safety planning in NSW. Closed

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			vicinity of fuel terminals *5.2 UK Health & Safety Executive (UKHSE)*	applied to inform land use planning decisions in NSW.	
4	Planager	Exec summary and Para 7 in Caltex's submission	*Exec Summary / Section 7: The developer's latest hazard & risk assessment report (30 April 2020) has inadequately assessed the risk associated with a vapour cloud explosion (VCE) at the adjacent Caltex fuel terminal. Using publicly accessible data relevant to the scenario, Caltex is of the firm view that the current assessment under predicts the likelihood of a VCE by several orders of magnitude; rendering the development in breach of NSW Land Use Safety Planning Criteria (HIPAP10) for both residential individual risk of fatality and societal risk.*	Detailed responses to Caltex concerns provided in their Executive Summary and in Section 7 are provided in Investec's response, items 12 to 25 below. The status of this paragraph as open / closed is detailed elsewhere and will be considered as Closed here to avoid duplication.	Detailed response to Caltex concerns provided in items 12 to 25 below in this table. Closed here to avoid duplication.
5	Planager	Exec summary	*Caltex notes that this finding is consistent with the justification for land use planning zone guidance in other jurisdictions noted above which recommend exclusion for such developments out to distances >150m from the facility boundary*	As per item #3 above.	As per item #3 above.
6	Planager	Exec summary	*Exec Summary: Caltex reaffirms that consideration for an exemption to established land use planning zones, in this case an exemption for mixed residential/commercial/retail land use in an IN2 Light industrial zoned location adjacent to a pipeline supplied bulk fuel terminal, must not be extrapolated to an exemption for compliance with land use planning acceptable risk criteria (HIPAP10). Developments, such as that proposed here, do not represent a simple trade-off of beneficial development vs community amenity for which such exemption clauses may have been*	Taking into account the concerns raised by Caltex in their response, as discussed in items 12 to 25, below, Planager's revised analysis shows that the development complies with the risk criteria for LUSP adopted in NSW (HIPAP10). As such, it is not straightforward to see where the trade-off expressed by Caltex lies.	Closed.

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			originally developed. Rather, if approved, such development would represent a trade-off of heritage conservation to an unacceptable community risk of fatality.		
7	Applicant	Exec summary	*Exec Summary: Experience in other jurisdictions is that encroachment of incompatible sensitive land uses into existing land use buffer zones surrounding hazardous facilities ultimately restricts the flexibility of industry to meet emergent market demands, hinders growth opportunities and may ultimately lead to an unsustainable position resulting in site closure. Often such factors are subtle and emerge over several years as a result of 'new occupier' objection to pre-existing minor amenity impacts (e.g. noise, traffic, odours) historically tolerated but subsequently imposed upon a much larger, less tolerant, population.*	Commercial considerations are outside of the scope of the QRA. As part of the EP&A Act requirements, the planning authority will assess the development on its merit and will take all considerations into account when making a decision. As AS1940 is being sited, the specific provision relating to alterations on adjoining sites under AS1940 cannot be ignored. The provisions in AS 1940 (or earlier requirements under legislation), specifically limit flexibility of industry.	Closed.
8	Planager	Exec summary bullet points i to vii	*i. The statement that a Buncefield event is 'barely credible'…* *ii. Although Planager have applied the recommended UK VCA model (Ref (8))…* *iii. The effect distances to the lower flammable limit (LFL) are reported as hundreds …* *iv. The QRA does not identify overpressure as an outcome…* *v. The QRA makes some potentially misleading statements about the mitigation…* *vi. The frequency estimates of a gasoline tank overfill and resulting large flammable cloud*	Detailed response to Caltex concerns listed in bullet points i to iv in the Executive Summary are provided in items 12 to 25 in this table. The status of this paragraph as open / closed is detailed elsewhere and will be considered as Closed here to avoid duplication	Detailed response to Caltex concerns provided in items 12 to 25 below in this table. Closed here to avoid duplication.

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			adopted *vii. The extremely low frequencies adopted for overfill result in a significant…*		
9	Planager	Para 5.3 in Caltex submission	*Section 5.3:* *Specifically, SEPP clause 66C requires the consent authority to:* *a) be satisfied that the potential safety risks or risks to the integrity of the pipeline that are associated with the development to which the application relates have been identified, and* *b) take those risks into consideration in the assessment of development.* *The land to which the clause applies is identified in clause 66C as any land:* *a) within the licence area of a high-pressure pipeline licensed under the Pipelines Act 1967, or* *b) within 20m (measured radially) of the centreline or easement of any of the listed pipelines.* *PS 18-010 also notes that there are certain types of developments such as high density residential, commercial or sensitive uses such as hospitals, schools, child care and aged care facilities which should be considered more carefully by the consent authority as they may introduce a higher or more vulnerable population near the pipelines listed under clause 66C.*	Details on the potential safety risks and how these are to be addressed under the Infrastructure SEPP are provided in a Planning Circular titled *Development adjacent to high pressure pipelines transporting dangerous goods*. Consistent with the Circular' requirements, the Planager ' QRA includes an assessment of the potential "safety risks" associated with the development adjacent to Caltex' high pressure fuel pipeline, with the quantitative assessment used as a methodology being the highest level of assessment, appropriate for the increase in population associated with the development. Potential safety risks have been assessed using NSW DPIE methods and criteria (HIPAP6/10) for land use safety planning and it was found that the risks posed by the pipeline to the proposed development are below the risk criteria published in HIPAP No 10. The Hazard Team within the NSW DPIE reviewed the pipeline QRA and any issues or additional actions have been closed.	Safety risks included in Planager Pipeline risk assessment which was reviewed by the NSW DPIE. Closed.

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10	Applicant	continued Para 5.3 in Caltex submission	*Caltex notes that the Sydney to Newcastle liquid fuels pipeline passes through the section of the development allocated for public parklands near the western boundary of the fuel terminal and the proposed building 5 (refer page 89 of DA Master Plan Report).* *Caltex objects to such public parklands being constructed in close proximity (potentially directly above) to a significant liquid fuels transmission pipeline which is operating under pressure. Caltex also raises concerns with the construction of building 5; particularly any potential for below ground excavations in close proximity to the transmission pipeline.*	"Risks to the integrity of the pipeline" is outside of the scope of the Planager QRA and is commonly considered in a Safety Management Study which needs to be conducted as per AS2885 requirements when there is a change to land use adjacent to the high pressure pipeline.	"Risks to the integrity of the pipeline" is outside of the scope of the QRA report and is commonly considered in a Safety Management Study (SMS) as per AS2885 requirements when there is a change to land use adjacent to a high pressure pipeline. The applicant is unable to perform this assessment on behalf of Caltex. Closed.
11	Whamcorp Pty Limited	Para 6 in Caltex's submission	*Section 6:* *Caltex objects to the proposed amended development application on the basis that change in land use associated with the development may impact Caltex's current position of compliance to, or demonstrated equivalence to, separation distance requirements of AS1940:2017* *6.1 Current AS1940:2017 compliance position*	AS 1940 has, in every edition from 1976 to today, in the section dealing with separation distances, the specific requirement is that *"Where alterations to the installation or adjoining site result in a breach of the required separation distances, the installation shall be assessed and brought into compliance or*	Closed.

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			6.2 AS1940:2017 Separation Distances do not mitigate fuel terminal VCE consequences	*decommissioned."* (AS 1940:2017 Clause 3.2.5.1) From 1978 until 2012, NSW Dangerous Goods Regulation 1978 Clause 129 mandated separation distances to be as required by AS 1940 and from then until the present, AS 1940 has been incorporated in an approved code of practice under the NSW Work Health and Safety Act 2011. Caltex cannot claim compliance with separation distances in AS 1940 without complying with the whole of Clause 3.2.5 Separation Distances (2017 edition reference or equivalent clauses in earlier editions). If Caltex is claiming equivalent safety by means other than simple distance, it needs to demonstrate that with respect to the proposed development.	
B. Caltex Detailed comment regarding the modelling of a Buncefield type scenario					
12	Planager	Exec Summary and Para 7.2 in Caltex' submission	*Exec Summary:* *(i) Exec Summary: The statement that a Buncefield event is 'barely credible' at the Caltex fuel terminal is not supported by Caltex or industry guidance. Inherent factors of tank height >5m, fill rates >100m3/hr, low wind/stable atmospheric conditions & potential offsite ignition sources that have been identified by the extensive incident investigation post Buncefield are present for a proportion of the time at the Caltex fuel terminal.*	The factors noted by Caltex in their response (stable wind conditions, tall tanks, high fill rates, ignition source) are indeed present for a portion of the time but these must be combined with the likelihood of a significant overfill for a Buncefield type scenario to occur. Such an event is extremely unlikely and has only occurred a handful of times throughout the world's many fuel depots and terminals.	The comment "barely credible" can be removed from a subsequent version of the Planager report. Closed

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			Section 7: Caltex's Conclusion on 2020 Planager QRA re VCE Scenario: *The statements in the QRA that this scenario is 'barely credible' are not supported. The relevant preconditions are present at Wickham and there are at least 6 well documented similar events readily acknowledged in literature and known to fuel terminal operators.*	The notion of "barely credible" is consistent with Caltex' risk assessment which was prepared at the conversion of the Caltex Kurnell refinery to a Terminal (Ref 1), where Caltex describes the frequency of an explosion resulting from the ignition of a significantly large vapour cloud formed following an overfill as "less than 0.01 in a million per year (<1×10-8 per year)" and further that "This event is not considered to be a significant contributor to the overall risk profile. In comparison, the average risk of fatality from a lightning strike is 0.1 in a million per year (1×10-7 per year)" . (Refer to Caltex's submission Section 8.3 Tank Overfill / Explosion Frequency in Caltex's PHA which includes an explanation that the overfill / explosion scenario relates to the Buncefield type event). From Caltex' comment in their PHA for the Kurnell Terminal it appears that (1) Caltex are in agreement about the rarity of a Buncefield style event, and (2) Caltex are capable of designing and operating their facilities in such a way that the likelihood of a Buncefield type scenario is extremely unlikely. Notwithstanding, the comment "barely credible" (Planager report, Ref 6) is subjective. This comment can be removed	

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				in any subsequent revision of the Planager report	
13	Planager	continued Para 7.2 in Caltex' submission	*Section 7:* *The Planager revised hazard & risk assessment report does not explicitly acknowledge overpressure as a potential outcome of an ignited flammable cloud or effects on the Wool stores. Table 11 Page 37 does not state explicitly the damaging impact criteria applied for the assessment (e.g. blast overpressure effect). In fact, the title of the last 2 columns references 'distance to centre of fire' rather than distance to outer contour of overpressure damage.*	Planager's modelling show that the extent of the overpressure footprint that could result in a fatality is similar to or smaller than the flash fire's lower explosive limit (LEL) envelope which was used in the QRA to characterise the extent and reach of a Buncefield event. Overpressures from VCEs do not contribute to fatality risk outside the extent of the LEL envelope that is already included as the flashfire impact area. The use of the flash fire foot print to determine fatality potential from a Buncefield scenario is therefore acceptable. To clarify for the reader of the Planager QRA, a subsequent revision of the QRA can include additional explanation on the approach taken in modelling these types of events Please note also that Planager's approach is consistent with other major risk assessments that have been carried out in NSW in the last few years, e.g. Shell and Vopak (Refs 3 and 4). These assessments were carried out in accordance with the requirements by the NSW DPIE, including HIPAP6 and HIPAP10	Subsequent QRA revision can include clarification on the approach taken to modelling Buncefield type events. Closed

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14	Planager	Para 7.3.1 in Caltex' submission	*Section 7.3 Consequence assessment* *7.3.1 Choice of model* *The QRA states that it uses the model from the UK HSE Health Safety and Laboratory (HSL) paper to estimate flammable cloud sizes from overfills of volatile materials. This is the same as the UK VCA model (Ref (8)). On this matter Caltex notes:* *• The choice of UK VCA model for this scenario is appropriate for use in QRA and regarded as good practice based on available guidance. (The only alternative is CFD which is more advanced, complex and therefore costly approach).* *• There is a very simple extension to the UK VCA model available that allows distances to overpressures to be estimated (Ref (6)). This is not applied in the Planager QRA. The QRA notes that overpressures could occur (footnote 5, page 19) but does not refer to over pressure in the model outputs (Table 11, page 37) and does not estimate these. This is an important omission.*	Planager's modelling shows that the extent of the overpressure footprint that could result in a fatality is similar to or smaller than the flash fire's lower explosive limit (LEL) envelope. Hence, overpressures do not contribute to fatality risk outside the extent of the LEL envelope that is already included as the flash fire impact area. The use of the flash fire foot print to determine fatality potential from a Buncefield scenario is therefore acceptable. Please also note that Planager's approach is consistent with other major risk assessments that have been carried out in NSW in the last few years, e.g. Shell Clyde Terminal conversion and Vopak Terminal expansion on Port Botany (Refs 3 and 4). Clarification can be included in subsequent revision of the QRA.	Subsequent QRA revision can include clarification on modelling of Buncefield event. Closed

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15	Planager	Para 7.3.2 in Caltex' submission	*Section 7.3.2 Input assumptions* *The input assumptions to the UK VCA model are summarised below and are regarded as appropriate.* *• Import rate 600m3/hr. This is conservative for typical Wickham import rates up to 400m3/hr. However, effect distances are only fairly weakly dependent on this parameter, so it is incorrect to refer to it as highly conservative.* *• 30 min release overfill duration. This is regarded as reasonable to represent the 'safeguards failed' case.* *• Width of the vapour cloud assumed to be similar to the Length (to LFL concentrations). This is appropriate and consistent with guidance (Ref (6)).*	Caltex agree with these Planager assumptions and no further action is required	Caltex agree with these Planager assumptions. Closed
16	Planager	Para 7.3.3 in Caltex' submission	*Section 7.3.3 Vulnerability* *.... However, it is not clear that 100% probability of fatality within the LFL footprint has been applied in the risk model. This must be clearly stated as it forms the basis for assessment of individual and societal risk.*	As per QRA convention in Australia, a 100% fatality has been assumed for people inside the flammable cloud (LFL footprint) resulting from a Buncefield incident. We can confirm that no mitigation has been accounted for for the population inside or outside of the building. In a subsequent revision to the QRA further clarification can be provided to confirm that 100% probability of fatality within the LFL footprint has been applied in the risk model, and that there have been no mitigation factors applied to populations inside the building or to other outside populations.	Subsequent QRA revision can include clarification on assumptions made. Closed

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17	Planager	continued Para 7.3.3 in Caltex' submission	*Section 7* *The updated QRA makes some potentially misleading statements about the mitigation that a building provides, and that the assessment incorporates a level of conservatism as building protection is not accounted for. Whilst this may be applicable for radiant heat effects from fire events, it is certainly not true for overpressure effects where potential for fatality is typically higher for masonry building occupants. Caltex considers that this effect, and any supporting assumptions, should be acknowledged as this proposal involves intensifying population inside buildings well within the potential effect areas of a gasoline overfill event.*	The original Planager report included VCE from LOC events. This has been reviewed and replaced with the LFL calculation from the Buncefield events. The walls on Building 4 and wool store 3 closest to the Caltex facility will be fire rated. This will provide mitigation from radiant heat, which accounts for about 90% of the location specific individual risk (LSIR) at these buildings. The fact that the QRA does not take into account any risk reduction from the 4 hour fire wall is clearly a highly conservative assumption, and as such we believe that the comment in the Planager QRA regarding conservativism built into the report should be retained. Please note that LSIR is a very important measure of in NSW DPIE LUSP methodology. The events with potential overpressure effects are the Buncefield events which are modelled as 100% fatality within the LFL footprint which is the most conservative assumption that can be made. The 4 hour fire wall will not provide protection. A statement can be provided in a subsequent version of the QRA to clarify this further.	A statement can be included in subsequent version of the QRA to clarify this further. Closed

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18	Planager	Bullet point (ii) in the Executive summary Para 7.3.4 in Caltex' submission	*Exec summary:* *(ii) Exec Summary: Although Planager have applied the recommended UK VCA model (Ref (8)); the results for the stated assumptions could only be reproduced for an estimated 15-minute release duration, not the recommended & stated 30 minutes.* *Para 7.3.4: Caltex has utilised an internal UK VCA model spreadsheet template to cross check the QRA results in Table 11. The results for the stated assumptions could not be reproduced for a 30 mins release duration. A sensitivity check was done for a shorter release duration (15 minutes rather than 30 minutes) and these results match fairly closely to those in the Planager QRA. Caltex's modelling for a 30-minute release duration returned ~150% higher modelled impact distances than those shown in Table 11 of the Planager QRA. The QRA also states that 'prolonged' overfills (footnote 1-page v) are required. Literature (Ref (6)), as well as Caltex modelling, indicates a cloud extending more than 100m can form within 5 minutes.*	Planager agrees with the use of a 30 minute release as the worst case duration. This is consistent with other major risk assessments that have been carried out in NSW in the last few years, e.g. Caltex and Shell Terminal development and Vopak expansion (Refs 1, 3 and 4). Subsequent version of the Planager QRA report can be updated with 30min duration as the worst case overfill duration.	Subsequent version of the Planager QRA report can be updated with 30min duration as the worst case overfill duration. Closed
19	Planager	continued Para 7.3.4 in Caltex' submission and Bullet points (ii) and (iv)	*- The Planager QRA (Ref. Table 11 Page 37) predicts effect distances to the LFL of hundreds of metres which are as expected and clearly sufficient to impact the wool stores and consistent with reported effects. This potential is acknowledged by Planager in table 11 although it is not explicit that it is overpressure damage*	Caltex agree with these Planager assumptions and no further action is required	Caltex agree with these Planager assumptions. Closed

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20	Planager	in the Executive summary	*- The QRA does not identify overpressure as an outcome or use the extension of the UK VCA model to estimate the distance to damaging overpressures e.g. exceeding 14kPa. This may have no material effect on the extent of fatality effects accounted for in the QRA, provided that 100% fatality has been assumed within the LFL, and also for societal risk that there are no mitigation factors applied to population inside the building or to other outside populations for this scenario.*	As per Planager item 14	Subsequent QRA revision can include clarification on modelling of Buncefield event. Closed
21	Planager	continued Para 7.3.4 in Caltex' submission and Bullet point (v) in the Executive summary	*The QRA makes some potentially misleading statements about the mitigation that a building provides. Whilst this may be applicable for radiant heat effects, it is not true for overpressure effects and this should be acknowledged as this proposal involves intensifying population inside buildings well within the potential effect areas of a gasoline overfill event with resultant blast overpressure.*	As per Planager item 17	A statement can be included in subsequent version of the QRA to clarify this further. Closed
22	Planager	Para 7.4.1 in Caltex' submission and Exec	*7.4 Likelihood assessment* *7.4.1 Tank overfill frequency* *In Table 8 of the updated QRA, the frequency of a major overfill event of a storage tank is determined to be 1.9 x 10-6 per year (based on 19% of all leaks outside of storage tanks being due to overfill) which is "extrapolated from IOGP data and using the major atmospheric storage*	Caltex were originally not available to provide information to inform the Planager QRA report (Ref 6) and statistical data bases were used without allowing details relating to the site operation and design to be included in the assessment. This situation has not been improved through the comments made by Caltex in their	The approach used to calculate the Buncefield event should be site and company specific. Use the

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		Summary vi and vii	*tank leak frequencies (rupture and complete inventory lost after 10min) of 10 pmpy" (1 x 10-5 per year). Whilst the stated data source and percentage of tank leaks attributed to overfill is considered to be appropriate in the absence of access to detailed Operator information, (reference 14 in the Planager QRA) it has not been applied appropriately. The following extract from IOGP report No. 434 – March 2010 (refer table 2.1 extract below) states a leak frequency of 2.8 x 10-3 per year for liquid spills outside of tanks rather than 1 x 10-5 per year used in the QRA. In this case, applying the 19% factor results in the frequency of a major overfill of 5.3 x 10-4 (instead of 1.9 x 10-6) per year. The significantly lower tank overfill probability used in the Planager QRA significantly underpredicts the stated quantitative risk outcomes.* --- *Given the variability in reported data it would also be expected that a QRA would include some sensitivity studies around the key parameters affecting the frequency for a scenario that has such a large consequence impact. There is no evidence of sensitivity assessment in the updated QRA*	submission (July 2020) which are also non site-specific (e.g. refer to Caltex submission Section 7.4.1 Tank overfill frequency, providing non-site specific analysis of possible frequencies to use, and then again, in Section 7.5 Effect on assessed risk, where it is made clear that no site specific operations and control measures information were used in their analysis). On further consideration, given Caltex's concerns, Planager now suggest that a better approach is to use the likelihood of a Buncefield event as calculated by Caltex for the conversion of their Kurnell refinery to Terminal (Ref 1). The likelihood includes site and company specific considerations such as plant design, maintenance and inspection schedules, operations team and other staff competency etc. The Kurnell situation can be tailored to the situation at the Wickham depot. Caltex calculates the likelihood of a Buncefield event as $1x10^{-8}$ per year for their Kurnell site. Assuming at least 10 petrol tanks fitting the criteria where a Buncefield event may occur, the likelihood per tank would be $1x10^{-9}$ per tank per year. Comparing the controls included in the Kurnell QRA (Ref 1) with those included at Wickham (Ref 6) Planager does not identify	Kurnell Terminal likelihood of $1x10^{-9}$ per tank per year as overfill controls and other inputs appear the similar (refer item #29 below providing a comparison between the two sites). Closed

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				any significant differences between the two sites so this approach appears particularly pertinent, especially seeing that the data and approach have already been approved by Caltex. The resulting societal risk curve developed using this approach is presented in the Planager's letter accompanying this table. The inputs used to develop the graph in Figure 1 in Planager's letter include Buncefield scenarios calculated for tanks 214, 378, 7971, 7972 and 482. All overfill scenarios included are assumed to last for 30 minutes despite Wickham site having access to CCTV and remote controlled shut down valves - this appears to be more conservative than what has been used in QRAs for other sites (e.g. Refs 1, 3 and 4). The increase in population includes that in wool stores 1, 2 and 3 and in buildings 4 and 5.	

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23	Planager	Para 7.4.2 in Caltex' submission	*7.4.2 Applicable wind speeds* *The UK HSE (Ref (7)) advises that low wind speed, stable atmospheric conditions (nil/low-wind conditions) are particularly dangerous because a highly homogeneous vapour cloud can be formed that may spread by gravitational slumping for hundreds of metres. Page 257 (Ref (7)) advises that 'nil/low wind' as a rule of thumb is an overlying wind speed of 3 m/s or less. Conservatively interpolating the available meteorological data (refer below) to account for wind conditions between zero and 2 m/s, Caltex estimates that these wind conditions occur approximately 17% of the time at this location. However, the Planager QRA has assumed only 0.4% by restricting the applicable Buncefield scenarios to only consider wind speeds in the range 0-0.3 m/s.*	Reviewing the UK HSE report (Ref 5) again we agree that higher wind speeds up to 3m/s at height can produce nil or very low wind speeds at ground level. Our review of the local meteorological data show that wind speeds between zero and 3 m/s can occur 22% of the time. It is important to understand that a windspeed condition of 3 m/s or less is not enough to produce Buncefield conditions (Ref 5). An overlying windspeed of 3m/s (measured at 10m above the ground) will only produce the calm conditions at ground level required for the event to occur if it coincides with: 1) stable weather conditions, normally categorised the Pasquil Stability category F (note that wind speeds below 3 m/s can also occur for weather categories A, B, C and E), AND 2) conditions of rapid ground cooling (i.e. a significant delta T), which includes the absence of solar heating (common during the day and absent during the night) According to UK HSE (Ref 5), these conditions are relatively rare (usually around 5% of the time). Further, UK HSE (Ref 5) states that: *This frequency will vary on a site by site basis around the world but the frequency is always fairly low*.	Subsequent revision of the QRA can be updated to include the probability of 0-3m/s wind speeds coinciding with stable weather category and conditions of rapid ground cooling. Closed

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24a	Planager	Para 7.4.3 in Caltex' submission	*7.4.3 Validity of listed mitigations* *In the last paragraph of the QRA in section 4.2.4, the likelihood of tank overfill and/or the consequence should an overfill occur has been further reduced by two orders of magnitude based on the additional preventative and mitigative controls at the Terminal. The Planager report states;* *These controls include independent high level shut-down (automatic) on all tanks; flammable vapour / liquid hydrocarbon detectors in the bunds (set at 20% LEL; for early detection of a spill); CCTV of all bunds (also for early detection of a spill as well as a fire); and manually initiated bund foam pourers (to mitigate ignited or unignited spills). In this case, the overfill frequency can be reduced by at least two factors of magnitude to 0.019 per million per year (1.9x10-8/yr),* *These additional mitigations are claimed in comparison with the assumed IOGP source data controls. However, the data sources include a variety of sites at least some of which may have independent high-level alarms and trips as for the Caltex fuel terminal. Also, the controls listed in this paragraph include "manually initiated bund foam pourers (to mitigate ignited or unignited spills)". However, bund foam pourers are not a valid control for a vapor cloud which is formed by gasoline cascading over a tank rim as defined in the Buncefield scenario.*	The report prepared by Sherpa on behalf of Caltex applied a risk reduction of 0.1 due to the bund foam pourers which can be activated on detection of a spill. Sherpa specified that this would reduce the risk of both an ignited and an unignited event. Planager used this information to reduce the overfill event likelihood. However, reviewing this assumption again we agree that this risk reduction should be removed from the Planager QRA as mitigating a potential Buncefield scenario.	Bund foam pourers risk reduction can be removed from a subsequent revision of the Planager QRA as mitigating a potential Buncefield scenario. Closed

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24b	Planager	Continued Para 7.4.3 in Caltex' submission	*Whilst it is accepted that gas detection and CCTV together with operator response may be slightly better than the average, with all these controls taken together it is considered to be overly optimistic to reduce the frequency by two orders of magnitude due to additional safeguards in comparison with the data source used. This further contributes to the under-estimation of likelihood and therefore risk of a Buncefield scenario. Whilst it is accepted that gas detection and CCTV together with operator response may be slightly better than the average, with all these controls taken together it is considered to be overly optimistic to reduce the frequency by two orders of magnitude due to additional safeguards in comparison with the data source used. This further contributes to the under-estimation of likelihood and therefore risk of a Buncefield scenario.*	The CCTV were assumed by Planager to allow for a reduction of the likelihood of an overfill scenario – on further review we agree that such protection may have an impact on the duration of an overfill scenario rather than on its likelihood.	CCTV monitoring with remote activation of shut-off valves may impact on the duration of an overfill scenario rather than on its likelihood – this can be included in a subsequent revision of the Planager QRA. Closed
25	Planager	Para 7.4.4 in Caltex' submission	*7.4.4 Frequency in Planager QRA* *As per Planager QRA Table 14 – Frequency of Outcome of Major Vapour Cloud Events the frequency included in the QRA appears to be 7.79E-5 pmpy per tank, i.e. approximately 8 x 10-11 per year per tank. It is also noted by Planager that there are some elements of conservatism in the QRA, i.e. all tanks assumed to be in gasoline service, but this is outweighed by other factors. Table below compares the impact upon this final estimated VCE frequency as a result of the observed inaccuracies of the input assumptions. Several cases are provided in Table 7.4.2 to*	As per item #22	As per item #22

Item	Responder	Location	Caltex comment	Response	Open / Closed
			demonstrate the sensitivity to particular factors. Both Tables 7.4.1 and 7.4.2 demonstrate that the Planager VCE frequency is underestimated by several orders of magnitude (i.e. a factor in excess of 10,000). *As per Table 7.4.1 a predicted VCE frequency, consistent with assumptions suggested in industry & regulatory guidance without obtaining any direct input from Caltex, would be approximately 4.3 x10-6 per year per tank. In the absence of specific facility input data, Caltex acknowledges that the above predicted frequency is representative, rather than an accurate measure, of the VCE scenario specific for the Caltex fuel terminal. Caltex's experience in developing safety cases for its fuel terminals would indicate that the facility specific estimate would be significantly closer to 4.3x10-6 per tank per year than 8x10-11 per tank per year. Caltex is of the view that an error of at least 3 orders of magnitude in the frequency of the Buncefield VCE scenario is evident in the Planager QRA.*		
26	Planager	Para 7.5 in Caltex' submission	*Refer Caltex's submission, not copied in here*	The discussions in Caltex's paragraph 7.5 rely on the findings in earlier paragraphs. Please refer to Planager's response above	The discussions in Caltex's paragraph 7.5 rely on the findings in earlier paragraphs. Please refer to Planager's response it

Item	Responder	Location	Caltex comment	Response	Open / Closed
					items 12 to 25. Closed
27	Planager	Para 7.6 in Caltex' submission	*7.6 Other Points* *7.6.1 Impact of Sydney to Newcastle (SNP) pipeline risk scenarios* *An addendum QRA (2018) attempted to assess the pipeline risk and Section 3.3.2 states that the total frequency of fatality from the pipeline anywhere in the development is 0.12 x10-6 per year. This does not match the risk transect in Figure 2 which suggests a pipeline maximum risk of 0.04 x10-6 per year.* *It is also not clear what adjustment factors such as ignition and directional probabilities have been used. Risks from the pipeline (which is outside the Caltex boundary but immediately adjacent to the development) do not appear to be accounted for in the 2020 QRA. Whilst pipeline risks are typically relatively low, the risk is not zero and should be accounted for cumulatively.*	The risk associated with the high pressure pipeline formed part of an addendum to the QRA for the site. The risk associated with the high pressure pipeline was not included in the site QRA as per discussions with the NSW DPIE as this is the convention in NSW for transport risks (similar to risk associated with DG transport on roads etc.). Further clarification can be included in a subsequent revision of the Planager QRA. Combining risks from a stationary facility with the risks from transport of hazardous materials is a complex matter - we suggest Caltex contact DPIE on this matter. As per verbal communication with the NSW DPIE at the time, including the pipeline risk into the site QRA would introduce questions regarding other site QRAs which are serviced by DG transport or pipelines where the risk was not included.	Further clarification can be included in a subsequent revision of the Planager QRA. Closed
28	Planager	continued Para 7.6 in Caltex' submission	*In addition, the pipeline risk has not been assessed with input from the Operator as is required under NSW government planning circular PS 18-010 "Development adjacent to high*	Addressed in item 10 above	Addressed in item 10 above. Closed

Item	Responder	Location	Caltex comment	Response	Open / Closed
			pressure pipelines transporting dangerous goods".		

Table 2: Tank overfill / explosion control - comparison between Caltex's Kurnell and Wickham sites

Note that only those controls relevant to Buncefield type events are included

Item	Type of control	Protective measure, Caltex Kurnell Terminal (Reference 1, Table 7: Tank Overfill / Explosion Controls)	Protective measure, Caltex Wickham Depot (Reference 2, Table 3.2)	Comment
29	*Prevention*	Independent level indication with high-high level alarm	Tank contents gauging with high level alarm and independent high-high level alarm (LAHH)	No difference
		Independent SIL-rated trip of tank inlet valve on high-high-high level alarm	Independent high level shutdown (LSHH). All designed and tested to meet SIL1 requirements. Trip isolated tank feed	No difference
		Tank design and maintenance program in accordance with industry good practice	Details not provided	Unlikely that Caltex would not meet with industry good practice in this regard. No difference
		Continuous monitoring of tank inventory from a centralised control room	Details not provided	PIRMP states site manned 24/365 and that Operations Coordinator monitors product flow / movements using tank gauging and level alarms. No difference
		Operating procedures controlling quantity of material transferred	Details not provided	Details provided in PIRMP. No difference

Item	Type of control	Protective measure, Caltex Kurnell Terminal (Reference 1, Table 7: Tank Overfill / Explosion Controls)	Protective measure, Caltex Wickham Depot (Reference 2, Table 3.2)	Comment
Cont. 29	*Control of ignition sources*	Classification of hazardous areas and selection of equipment and protective systems is conducted in accordance with Australian Standards HB13-2007 and AS2381. All tanks have installed earthing and maintenance program	Details not provided	Details provided elsewhere include the Newcastle Terminal Hazardous Area Classification which provides details on flammable products tanks and pump compounds. No difference
	Detection	Flammable gas detectors and control room alarms for tank compounds of low flash point flammable liquids	Gas detection installed in all flammable bunds and alarms and 20% LEL.	No difference
		Remote CCTV monitoring for tank compounds of low flashpoint flammable liquids	Closed Circuit TV (CCTV), covering all tanks and bunds with flammable storage. Will allow early detection of tank fires, spills to bund including assisting in detecting overfill	No difference
	Isolation	Remote-actuated fire-rated tank inlet / outlet valves	Details not provided	Several other inputs refer to remote activated manual response. Unlikely that remote actuated manual isolation of tank inlets and outlets would not be fitted, as automatically (SIL rated) valves are fitted. Unlikely to be different.
	Event response	Facility Emergency Plan & Pre-incident plans.	Details not provided in Ref 2.	Other inputs show that Caltex site have PIRMP, Emergency Plans and procedure available No difference

References

1 *Caltex Refineries (NSW) Pty Ltd Proposed Kurnell Product Terminal Preliminary Hazard Analysis*, R4Risk Pty Ltd, 15 May 2013

2 *Risk equivalence review AS1940:2017 Separation Distance Non Compliances Caltex Newcastle Terminal*, Caltex Australia Petroleum, Sherpa, 5 September 2019

3 *Clyde Terminal Conversion Project Preliminary Hazard Analysis*, Shell Company of Australia Pty Ltd, Sherpa, January 2013

4 *Site B Stage 4 Development Port Botany*, Vopak Terminals Australia Pty Ltd, Sherpa August 2015

5 *Review of Vapour Cloud Explosion*, UK Health and Safety Executive, RR113, 2017
Incidents

6 *Hazard and Risk Assessment for the Development of the Wickham Wool Stores Adjacent to the Existing Caltex Fuel Depot, Planager*, 30 April 2020