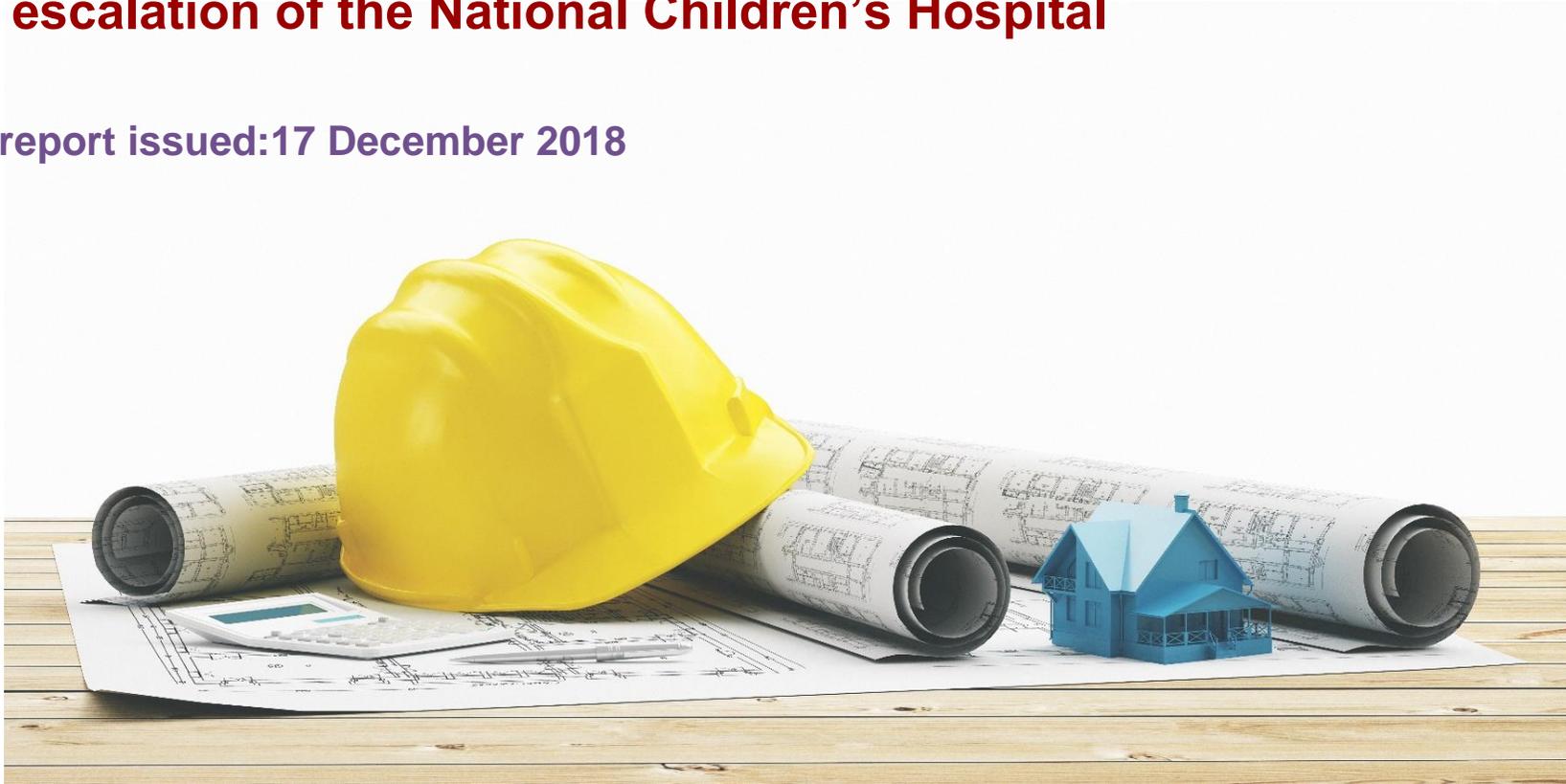


NATIONAL PAEDIATRIC HOSPITAL DEVELOPMENT BOARD

Report on preliminary observations in relation to the construction capital cost escalation of the National Children's Hospital

Final report issued: 17 December 2018



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FREEDOM OF INFORMATION

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1 INTRODUCTION & CONTEXT

1.1 INTRODUCTION

The NPHDB (“Board”) is a statutory body which has been established to carry out the development of the following:

- New Children’s Hospital (“NCH”) at St. James’s Hospital site in Dublin.
- Urgent care centre (satellite) – Connolly Hospital
- Urgent care centre (satellite) – Tallaght Hospital

The Board have engaged a number of external professional services firms who collectively are the Design Team responsible for the design and costing of the NCH development.

The original design for the NCH was completed in June 2016 by the Design Team. Following completion, the Board tendered for contractor services for the following core areas:

- Main contractor works – Civil, Structural and Architectural (“CSA”)
- Mechanical installations (“Mech”)
- Electrical installations (“Elec”)

The procurement strategy adopted by the NPHDB at the time of tender issue in July 2016 in respect of the NCH was a 2 phase approach as follows:

Phase	Detail
A	Full quote for substructure works based on a full sub structure design with full bill of quantities (“BOQ”)
B	Initial quote for completion of the remainder of project construction based on preliminary 1 st stage design with an approximate and remeasurable BOQ reflecting this preliminary 1 st stage design.

1 INTRODUCTION & CONTEXT

The Guaranteed Maximum Price (“GMP”) process began in October 2017 with final design packages being issued over the period November 2017 – June 2018. Activities relating to design deliverables and measurement under the GMP process were undertaken predominantly in the period from April – October 2018. Following completion of these activities, the adjusted contract sum / agreed GMP is currently significantly in excess of the estimated amount per the Definitive Business Case.

Summary of cost escalation	Completion	NCH construction cost €'m	Other project work €'m	Total €'m
Total cost definitive business case (“capital budget”)	February 2017	571	412	983
Total cost per GMP process	November 2018	890	543	1,433
Increase in costs (“NCH capital cost variance”)		+319	+131	+450

Scope limitation

The variance in NCH construction costs of €319m is hereafter referred to as the “NCH capital cost variance” and the review conducted has been limited to comment only on the NCH capital cost variance.

1.2 CONTEXT OF REVIEW

On 5 September 2018, it was agreed by the NPHDB Board to commission a review of the escalation in capital costs but prior to this review commencing, the GMP process needed to have concluded.

As part of an overall Board initiative to review the NCH capital cost variance, Mazars were requested to provide professional services to the National Paediatric Hospital Development Board (“NPHDB” or “Board”) in respect of a review of the GMP / Pre-Phase B process undertaken as part of the development of the NCH at St. James’s Hospital site in Dublin. A full review of the scope of the engagement began in November 2018, the terms of reference of which were in the process of being concluded on 16 November 2018. Engagement discussions had outlined an indicative timeframe for the review which was estimated to conclude in late December 2018.

The NPHDB were notified on 16 November 2018 of the urgent need to provide a preliminary report for 23 November 2018. In light of this urgency for report issue, demands on NPHDB resources and the significant reduction in timeframe available, the revised limited terms of reference was developed as a basis for this preliminary review, the specific details of which have been outlined in Section 2.

Section 3 outlines describes in greater detail the **limited nature** of this review.

2 TERMS OF REFERENCE

The following table details the terms of reference for this preliminary review and the relevant sections in this report where we have documented our observations:

TOR No	Term of reference	Report Commentary
1	<p>Perform a high - level review of the GMP report as issued by the NPHDB and design team, issued on 12 November 2018, (“GMP report”) in order to determine the veracity of the following specific elements within the report:</p> <ul style="list-style-type: none"> Chronology of significant events from completion of outline design in June 2016 until completion of the GMP process Financial analysis of the key changes in the capital budget from €571m to €890m following completion of the GMP process (“the NCH capital cost variance”) 	Section 5
2	<p>On the basis of the GMP report issued to the Board:</p> <ul style="list-style-type: none"> Review the extent to which the NCH capital cost variance was attributed to changes in the design (specification, omissions, assumptions and design scheduling). Review of the reporting of cost escalation to the Executive, Board and HSE in terms of timeliness and content. Convene 1-2-1 discussions with agreed NPH team members to discuss the design and estimation process 	<p>Section 6</p> <p>Section 6</p> <p>Section 6</p>
3	In the context of the items reviewed in 1 and 2 above, provide at a high level, recommendations for change in governance, management and operational practices within the NPHDB in relation to the delivery of the capital programme.	Section 7
4	Provide the reader with a clear understanding of the limited nature of this preliminary review due to timing and other considerations.	Section 3

3 SCOPE LIMITATIONS & OTHER MATTERS

The purpose of this section is to provide the reader of this report with a clear understanding of the limited nature of this preliminary review and the special or unique circumstances of the project under review.

No	Key matters to be highlighted
1	This document is to be regarded as confidential to the NPHDB. It has been prepared for the sole use of the NPHDB. No responsibility or liability is accepted to any other person in respect of the whole or part of its contents. Before this document, or any part of it, is disclosed to a third party, our written consent must first be obtained.
2	The deadline for the preparation of this report did not allow the time necessary to provide all of the normal levels of professional care and attention in relation to the management, planning, field work and reporting necessary to discharge the terms of reference. Whilst every effort has been made to accurately report and comment on our work, carrying out an assignment of this magnitude in such a short space of time brings with it a much higher probability of errors arising.
3	The report contains preliminary observations following this short and intensive high-level overview of information, facts and discussions around the significant escalation of costs. The preliminary observations and draft recommendations contained within this report could change should a more comprehensive and detailed review be undertaken.
4	A significant volume of information is available to support the relevant activities, given the scale of the project. In light of the limited scope and short timeframe of this review, a high - level review of key aspects of relevant documents was completed in order to support information disclosed in this report. We did not examine all elements of the extensive volume of information available and therefore we can provide limited assurance on the completeness and accuracy of our observations. In addition, we did not examine the detailed legal documentation or the client – contractor engagements during the GMP process.
5	The development of the NCH and satellite facilities is being managed by a specially created Board, whose key operational and management responsibilities are primarily discharged by external professionals and advisors.
6	The Board have adopted a fast-track two-staged tender / procurement model with a view to delivering the project two years ahead of what could normally be achieved using the traditional procurement approach.
7	The project is a “once off” event in national paediatric care terms and has relatively few comparable benchmarks within Ireland or indeed internationally.
8	We provide no assurance as to the completeness of the GMP of €890m or the adequacy of the GMP as an estimate of the total projected capital costs to deliver the construction element of a fully functional hospital. Relevant financial information has been agreed to Design Team reports and tender information where relevant.

4 OUR APPROACH

We adopted the following approach in completing this preliminary review. The approach takes into account those scope limitations noted in Section 3.

No	Approach adopted								
1	The GMP report issued by NPHDB on 12 November 2018 was reviewed for understanding and context.								
2	A high - level review of key underlying documents was performed to support key information contained in this report relevant to the terms of reference.								
3	We reviewed the timeline of key events (<i>see Section 5.1</i>) and key financial information (<i>see Section 5.2</i>) contained with the GMP report and compared to key underlying documents. This was discussed with key NPHDB Executive and Design Team members to determine consistency.								
4	An initial level high assessment was performed to identify (where possible in the time available) the fundamental events / drivers that gave rise to the cost escalation.								
5	<p>The key facts and our initial assessment of the situation was shared with members of the Executive and Design Team, following which we invited any comments or observations.</p> <p>Discussions were held with the Design Team and the following key personnel within the NPHDB:</p> <table border="1" data-bbox="817 837 1496 970"> <thead> <tr> <th colspan="2">NPHDB personnel</th> </tr> </thead> <tbody> <tr> <td>Project director</td> <td>Design director</td> </tr> <tr> <td>Commercial director</td> <td>Finance Officer</td> </tr> <tr> <td>Project controls director</td> <td>Board member</td> </tr> </tbody> </table> <p>The key points and understanding developed during these discussions have formed the basis of information contained within this report.</p>	NPHDB personnel		Project director	Design director	Commercial director	Finance Officer	Project controls director	Board member
NPHDB personnel									
Project director	Design director								
Commercial director	Finance Officer								
Project controls director	Board member								
6	<p>Following discussions with the relevant NPHDB Executive & Design Team members (as per point 5), we:</p> <ul style="list-style-type: none"> • Developed observations in relating to capital cost escalation • Identified areas for potential change • Formulated key recommendations for change 								
7	This preliminary report was compiled summarising the outputs of 1 – 6 above.								

5 OUR UNDERSTANDING OF THE SITUATION

On an overall basis, there was a significant escalation of NCH construction cost between the definitive business case and the GMP as shown below:

	NCH construction cost €'m	Gross area sq.m	Cost per sq.m €
NCH cost per definitive business case	571	159,357 **	3,600
NCH cost per GMP report	890	~158,000	5,600
NCH capital cost variance	+319	(1,357)	+2,000
NCH capital cost variance (%)	+56%	(1%)	+57%

*** During our review, we observed that no gross sq.m was noted in the definitive business case. For the purposes of the analysis above, the gross area of 159,357 sq.m has been taken from the Stage 2B Final report as per page 54 of the GMP report as a best estimate of the gross area in the business case budget.*

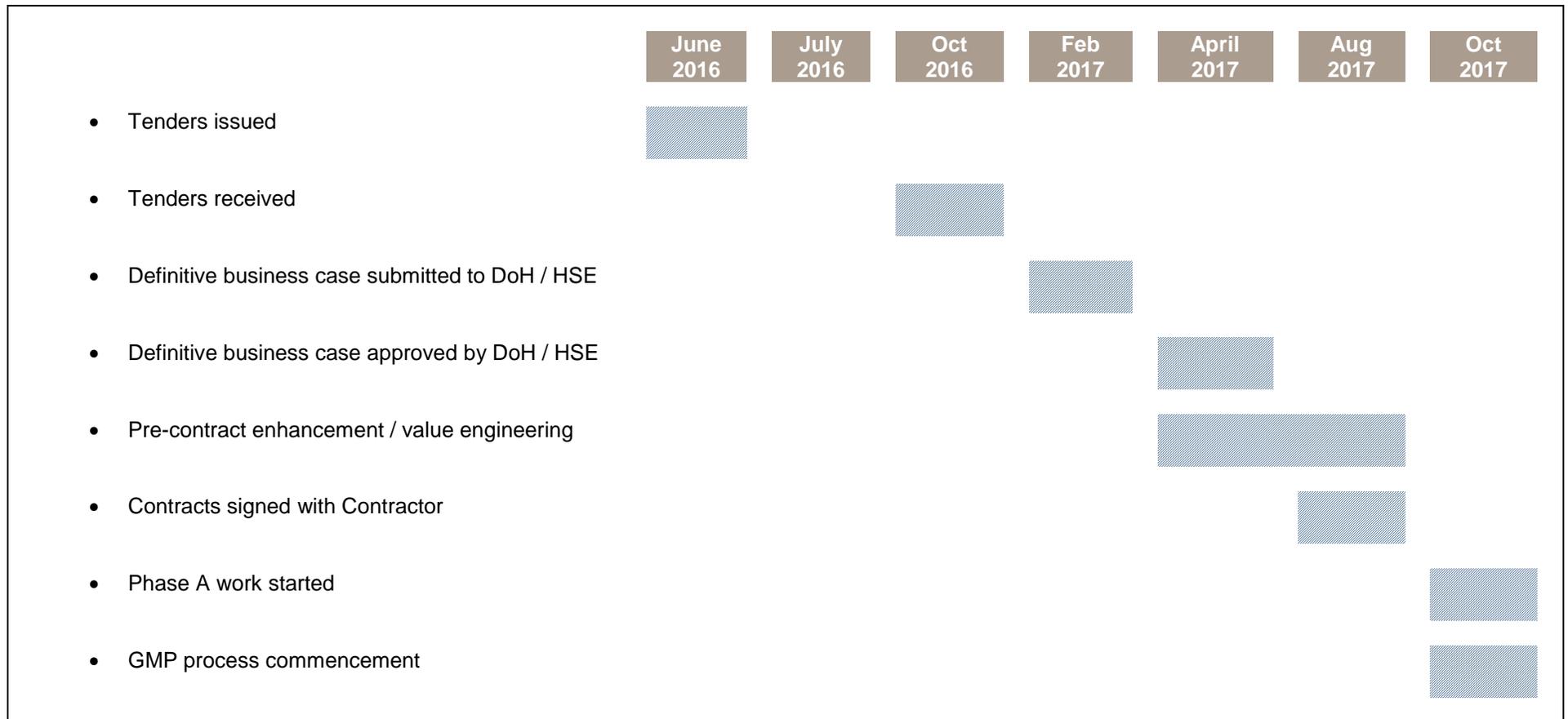
This section will outline, based on our preliminary review, our understanding of the timeline of key events and the related financial impact as follows:

- Timeline of key events – see Section 5.1
- Summary movement in NCH capital costs – see Section 5.2

5 OUR UNDERSTANDING OF THE SITUATION

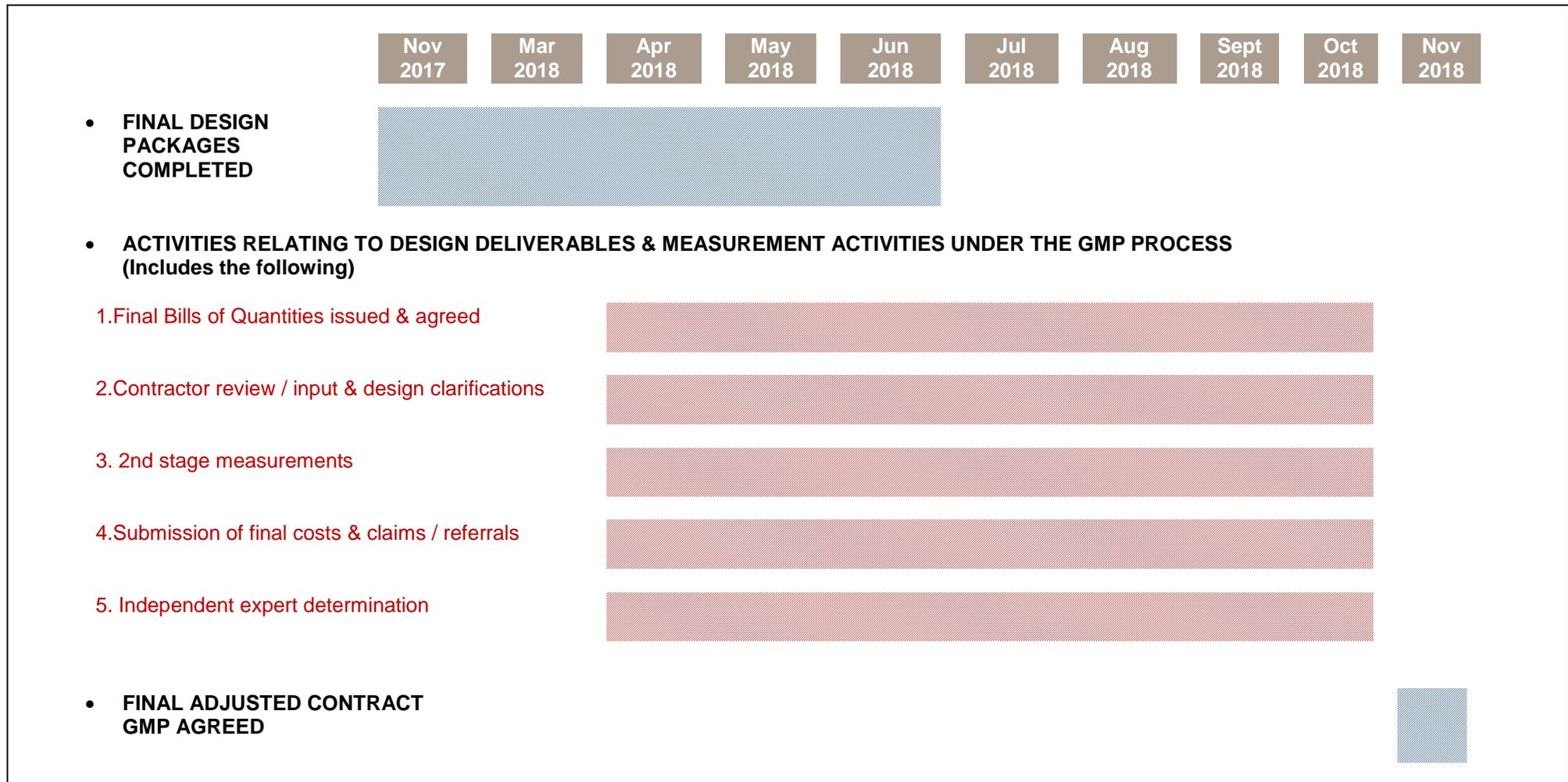
5.1 TIMELINE OF KEY EVENTS

5.1.1 June 2016 – October 2017



5 OUR UNDERSTANDING OF THE SITUATION

5.1.2 November 2017 – November 2018



Further detail in respect of key events noted above has been outlined in Section 5.2 of this report.

5 OUR UNDERSTANDING OF THE SITUATION

5.2 SUMMARY MOVEMENT IN NCH CAPITAL COST

The NPHDB developed a definitive business case estimate of €571m representing the best estimate of the NCH capital cost of construction. As outlined above in Section 5.1, there were a number of key events that were noted from issue of original design in June 2016 to agreement of GMP in November 2018. An analysis of the key financial events, as illustrated in the GMP report of 12 November 2018, has been outlined below which reconciles the NCH capital cost per the definitive business case as approved to the agreed GMP / adjusted contract sum:

Period	Event	Event Key	NCH capital construction cost €'m	Analysis of cost by area				
				CSA €'m	Mech €'m	Elec €'m	Lift €'m	Contractor Mark -up €'m
Oct-16	Contractor tenders received	A	636	401	106	97	6	26
	Unanalysed changes - tender v business case	**	5	3	1	1	-	-
April - Aug 17	Targeted VE exercise (included in business case)	B	(70)	(46)	(10)	(14)	-	-
Apr-17	Definitive Business Case as approved		571	358	97	84	6	26
	Unanalysed changes - tender v business case	**	(5)	(3)	(1)	(1)	-	-
Aug-17	Programme alignment	C	20	15	2	2	-	1
Oct-17	Sprinkler system	D	20	-	18	-	-	2
April - Oct 18	2nd stage measurement	E	142	43	44	44	-	11
April - Oct 18	Programme & preliminaries	F	92	60	18	14	-	-
April - Oct 18	VE not achieved	G	50	35	(2)	14	-	3
Nov-18	GMP / adjusted contract sum		890	508	176	157	6	43
	Variance v defined business case		+ 319	+150	+79	+73	+0	+17
	Variance v defined business case (%)		+56%	+42%	+81%	+87%	(1%)	+65%

** There were €5m of additional budgeted items added to the €636m tender sum in arriving at the definitive business case budget of €571m. The €5m of additional items were not analysed during our review. Mazars have for the purposes of the analysis above allocated the €5m in proportion to the elements noted in GMP / adjusted contract sum. Our analysis above includes these items in arriving at the definitive business case amount of €571m for illustrative purposes and a corresponding correction has been made in the movement from the €571m to €890m, thereby effectively reconciling the €636m per tenders to the GMP €890m which formed the core focus of our review.

The timeline of events as outlined in Section 5.1 and analysis of the components of cost escalation outlined above are consistent with our limited examination of underlying information and the substance of our discussions with the Executive and the NCH design team.

5 OUR UNDERSTANDING OF THE SITUATION

5.2.1 Commentary on events A - G

Event A - Contractor tenders received (€636m)

Contract tenders were received from the main contractor, mechanical and electrical installation contractors and lift contractors (“the contractors”) in October 2016. The most competitive tender sum in total was €636m which was in excess of the budget expected by the Board and stakeholders. Attempts to manage the overall NCH capital cost are discussed in *Event B – Target VE Exercise*.

Event B - Targeted VE exercise (€70m)

As noted in Event A, the contractor tenders received were in excess of Board and stakeholder expectations. A significant review of the potential of cost savings in the form of value engineering (“VE”) was undertaken, the outcome of which was a targeted cost reduction of €70m identified by the Design Team. As outlined in Event G, the VE target was not achieved.

Event C - Programme alignment (€20m)

Tenders for all contractor works were issued in parallel in July 2016. As a result of the tender process not being operated in sequence, a review of all contractors’ programme schedules resulted in the agreed inclusion in the adjusted contract sum of €20m relating to additional cost of alignment of all contractors construction and installation schedules based on the scope of work at that point in time. The indicative timescale of the programme at time of tender was 48 months but this was extended to 52 months following contractor consultation at an additional cost of €20m.

Event D - Sprinkler system (€20m)

Following issue of the tender, the Board were notified by a relevant fire certification body, that there was a requirement to include a sprinkler system in the design in order to comply with relevant legislation. This requirement was not in place prior to initial planning application and approval. A review was undertaken to cost and incorporate the system in the NCH design at a cost of €20m. We note however that the funding source of this system has not yet been approved.

5 OUR UNDERSTANDING OF THE SITUATION

Event E - 2nd stage measurement (€142m)

As part of the GMP process, the involvement of a contractor in the process was seen by the Board as beneficial to identify gaps, validate and verify the design and reduce / eliminate any future claims following agreement of the GMP. As part of GMP process, there were a number of various continuous activities undertaken by both the contractor and the Design Team in relation to design deliverables and measurement as noted below:

1. Design packages were being finalised from the period November 2017 to June 2018.
2. Following completion of these packages, a process of consultation between Design Team and contractors began.
3. Final bills of quantities (“BoQ”) were developed and agreed on the basis of agreed design packages.
4. Designs and BoQ were subject to measurement verification by all parties in the process – the process of measurement agreement during the GMP process (i.e. 2nd stage) is known as the “2nd stage measurement”.
5. Contractor claims were submitted and where resolution between parties was not found, an independent expert adjudicated the decision. The GMP process clearly outlined a provision for an independent expert to make binding decisions, and therefore ensure a binding GMP was arrived at when items were disputed.

Resolution of all measurement and claims in November 2018 resulted in the GMP amount of €890m for the NCH capital construction cost. It was noted in the GMP report dated 12 November 2018 that a key driver in the escalation of costs was the 2nd stage measurement process. The cost escalation noted in respect of this process was €142m with the following analysis of the increase being agreed to Design Team reports:

	User change €'m	Design development €'m	Statutory changes €'m	Omissions in Design / BoQ €'m	Total €'m
CSA	5.62	33.60	0.78	3.41	43.41
Mechanical	5.99	30.94	3.72	3.51	44.16
Electrical	7.13	22.87	2.06	11.70	43.76
Profit on services	1.64	6.73	0.72	1.90	10.99
Total	20.38	94.14	7.28	20.52	142.32

The above analysis is outlined in further detail below.

5 OUR UNDERSTANDING OF THE SITUATION

User change (€20m)

At the time of tender issue, the user engagement process in respect of the NCH design had not been finalised. Ongoing consultation with the end user groups prior to design package finalisation resulted in design changes which yielded an increase in cost of €20m.

Design development (€94m)

Upon development of the original design in June 2016 for tender issue, there was acknowledgement by NPHDB that the design at the time was not fully complete in all aspects. Furthermore, there was also an acknowledgement by NPHDB that contractor involvement under the GMP process was always required and considered valuable in terms of construction buildability and efficiency including, adopted pre-fabrication techniques, etc.

We understand, based on discussions, that elements of the BoQ for tender purposes, specifically mechanical and electrical installations, were developed on a factored - up approach whereby the Design Team completed an in-depth design analysis of a subset of rooms (~ 120) and developed a cost estimate for these rooms on the basis of a number of cost assumptions. The estimate cost for the subset analysed was factored up to represent the total number of rooms in the hospital design.

Discussions with the design team noted that the user engagement process in terms of design was not completed to an expected level prior to design issue, thereby creating the necessity to include a number of design assumptions in the original design, particularly in mechanical and electrical.

We noted from discussions that neither the overall footprint / geography of the NCH or the ultimate fundamental functionality or vision for the hospital changed significantly between original and final design.

In arriving at the final design, the full scope of design for all elements of the hospital was finalised which resulted in additional costs of €94m per the analysis of the Design Team. It is our understanding that based on discussions that the additional cost of the development of design is primarily driven by increases in the quantity of materials in combination with the detailed specification of the materials and design.

Statutory changes (€7m)

There were a number of legislation changes between the time of the original design issue in June 2016 and that included in the final design packages. As outlined in the GMP report, the cost of these statutory changes resulted in an additional cost of €7m and is attributed to the following elements:

- Conditions attached to the Fire Certificate affecting the detailed design which were addressed during the Pre-phase B period.
- Changes incorporated during the detailed design period to reflect the outcome of the Grenfell fire as advised by the Fire Consultants

While the cost of this change has resulted in a significant additional cost, it would appear that these costs were not within the control of the Design Team at the original design phase and have arisen from external factors.

5 OUR UNDERSTANDING OF THE SITUATION

Omissions in BoQ / Design (€21m)

The Design Team have identified circa €21m of additional costs which were not included in the tendered amount which relate to omissions. These omissions have been analysed into 2 core elements which ultimately had the consequence of a lower BoQ being issued at tender stage:

- Update of initial design assumptions used in original design
- Items not measured as part of original design measurement

Event F - Programme & preliminaries (€92m)

Following an extensive GMP process, it is clear from other events noted in this section that there were considerable costs associated with additional BoQ requirements and design development / specification. We understand from discussions, that the additional scope of work gave rise to claims from the contractors across the following core areas:

- **Fixed preliminaries cost** – effective fixed overhead costs claimed by contractors to support the programme of works (mainly infrastructure)
- **Variable time-based preliminaries cost** – effective cost of additional services to be provided by the contractors to deliver on the programme of works
- **Programming / clashes cost** – the cost of aligning all contractors work programmes given the increased scope of work. As noted in other events, the additional scope of works resulted in a further increasing of the programme period from a 52-month period (at contract signing) to a 56.75 month period under the agreed terms of the GMP.

As outlined in the GMP report, contractor claims in this area were noted at €283m. However following independent expert determination, a settlement of €92m was determined.

Event G - VE not achieved (€50m)

As noted in Event B, a targeted reduction of €70m in capital cost was set through value engineering (“VE”). As part of the GMP process activities relating to design deliverables and measurement between April and October 2018, it was determined that only €20m of VE was achieved, thereby resulting in an additional €50m relative cost.

Prima facie, as the targeted VE was not achieved it would suggest that the targeted reduction was overly ambitious. From discussions with the design team, the consensus among the team was that the VE targets were achievable, however the application of the VE targets did not go to plan.

5 OUR UNDERSTANDING OF THE SITUATION

Protracted negotiations between contractor and the design team during the VE process resulted in design delays and it was considered beneficial in overall project terms to proceed without achieving targets due to the significant escalation of costs that were likely to materialise should the project timeline be extended further.

While we understand that a detailed process was undertaken to determine the targeted VE reduction, the review did not identify any significant issues surrounding the quantities included in the tendered BoQ or the core assumptions underpinning the original capital budget methodology.

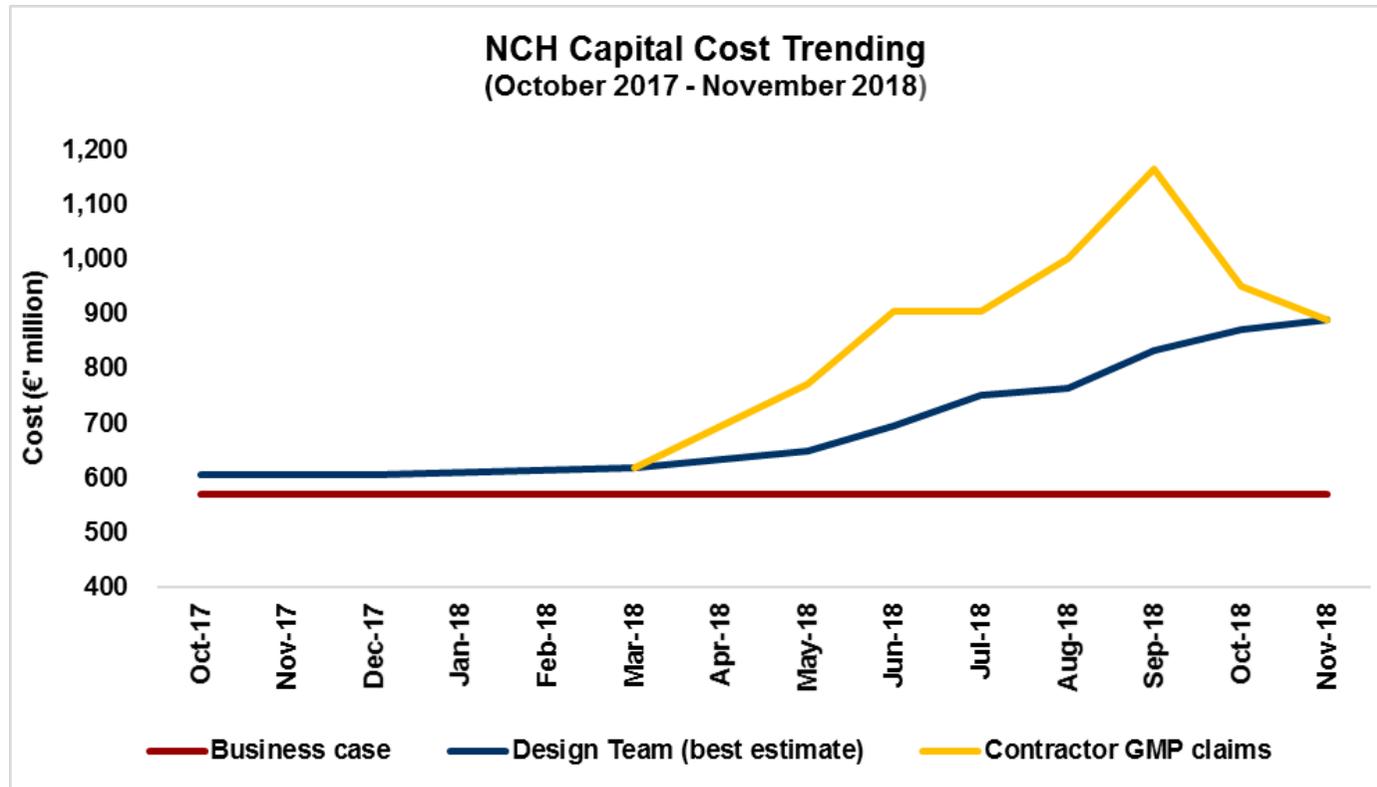
6 REVIEW OF THE REPORTING OF THE CAPITAL COST ESCALATION

Section 5.1 and 5.2 of this report outline in significant detail, the milestone events and the corresponding financial impact which has contributed to the significant increase in the NCH capital construction cost from €571m to €890m, hereafter referred to as the “escalation” or “NCH capital cost variance”.

This purpose of this section is to comment as to the timeliness and content of the reporting of the escalation to the Executive, Board and DoH/HSE.

6.1 COMMENTS ON REPORTING OF ESCALATION

We have reviewed the cost trending reports issued by the design team to NPHDB over the period October 2017 to November 2018. Based on the information completed, we have prepared the following analysis of the escalation in costs over the period which is consistent with that contained within the GMP report issued on 12 November 2018.



6 REVIEW OF THE REPORTING OF THE CAPITAL COST ESCALATION

6.1.1 Comments on cost escalation - including reporting to NPHDB Executive & Board

The following are key observations on capital cost escalation based on information reviewed and discussions noted during our review:

- The NCH capital cost per the **definitive business case** remained consistent at €571m since it was developed in February 2017. There was no significant revision of the capital budget assumptions following design development and value engineering processes.
- The “**Design Team best estimate**” represents the trending of the best estimate of the total NCH capital project costs. In respect of this trending, we note the following:
 - Design Team reports were shared with Executive team members at all points during the period noted above.
 - The best estimate of the Design Team was approx. €40m in excess of business case sum of €571m for the period from October 2017 to March 2018. The €40m overrun versus the business case was known to the Board and represented the following amounts:
 - Programme alignment at contract signing (€20m) – as outlined previously in Section 5.2 (*Event C*)
 - Sprinkler system (€20m) – as outlined previously in Section 5.2 (*Event D*)
 - Following completion and issuing of all design packages between November 2017 and June 2018, the GMP process activities relating to design deliverables and measurement began and a formal quantification of costs was developed. In the early stages of the quantification stage (April – May 2018), a gradual rise in costs was reported with costs approximately at approximately €650m at the end of May 2018. As the quantification was at early stage, there was expectation that this trend would cease once a clearer picture could be seen from package cost completion.
 - Design best estimate costs increased sharply in June and July 2018 as more packages were costed. Contractor review and input was ongoing during this period, in particular regarding Mechanical and Electrical elements, which resulted in potential increased costs in future months. The potential significant rise in costs was reported to the Board in June 2018 with further work to be done to provide more certainty as the GMP process gathered pace.
 - The significant escalation in costs became more apparent in July 2018 and a formal report was presented by the Design Team noting that the likely best estimate was €755m. The Board and relevant subcommittees were notified of these increasing costs in August 2018 and the other options available to the Board, given the rise in costs and the delays in the GMP process.
 - Significant escalation was evident in September – October 2018 as the divergence between Design Team estimates and contractor claims was resolved through a process of independent expert determination. Further updates on trending were provided to the Board in these months.

6 REVIEW OF THE REPORTING OF THE CAPITAL COST ESCALATION

- The “**Contractor total**” represents the total costs claimed by the contractor as part of the GMP process. In respect of this trending, we note the following:
 - It is evident that a clear divergence in cost expectation develops at a very early stage in the GMP quantification cycle.
 - It is our understanding that early stage gaps in cost expectation were viewed as an excessive level of contractor claims. Further progression on GMP package completion was expected to normalise high contractor claims, as also was the independent expert determination process.
 - Significant contractor claims were received in September 2018. As noted in Section 5.2, the independent expert determined that a substantial reduction in these claims be applied in settling the GMP of €890m.
 - The GMP agreement of €890m is evidence, in retrospect, that the perceived excessive contractor claims noted in early phases of the GMP process materialised into significant additional capital cost.

6.1.2 Reporting to DoH / HSE

In addition to the reporting of cost escalation to appropriate individuals / groups within the NPHDB, the following are considered key reporting events:

Date	Form & nature of reporting
20 October 2017	The Children’s Hospital Project & Programme (“CHP&P”) Steering Group were formally briefed of additional costs on this date, €40m of which relates to the NCH capital project (€20m programme alignment & €20m sprinkler)
12 December 2017	The CHP&P Board were formally briefed on this date of items brought to the attention of the CHP&P Steering Group on 20 October 2017 as noted above.
17 August 2018	It has been confirmed through discussions with the NPHDB Executive that, on this date, the HSE was updated on the escalation in cost to €766m.
24 August 2018	It has been confirmed through discussions with the NPHDB Executive that, on this date, the DoH was updated on the escalation in cost to €766m. We also understand through discussions with the NPHDB Executive that, on this date, a verbal communication was provided to DoH of a contractor claim which had recently been received for circa €200m.
7 September 2018	A detailed briefing note in relation to GMP developments was issued to both the HSE and DoH.

6 REVIEW OF THE REPORTING OF THE CAPITAL COST ESCALATION

We have outlined our understanding of the situation in Section 5 and commented on the reporting of the cost escalation above. This section summarises our key high - level observations arising from our limited review in relation to the escalation of NCH capital construction cost from €571m to €890m as it currently stands as per the GMP.

The following are our key observations in respect of the NCH capital cost escalation:

1. The timeline of events as outlined in Section 5.1 and analysis of the components of cost escalation outlined in Section 5.2 are consistent with our limited examination of underlying information and the substance of our discussions with the Executive and the NCH Design Team.
2. The initial financial analysis in section 5.2 of this report has concluded that the tenders received in October 2016 noted a contract sum of €636m. A definitive business case was completed in February 2017 which outlined an expected capital budget of €571m taking into account targeted savings, mainly through value engineering (“VE”).

This definitive business case was approved by DoH and HSE in April 2017. The amount finally agreed with the contractor for the NCH construction in November 2018 as part of what is known as the guaranteed maximum price (“GMP”) process is now €890m. This represents an increase of €319 million over budget which in percentage terms equates to a projected cost escalation of 56%.

In percentage terms, the cost escalation was highest in Mechanical & Electricals headings at 81% and 87% respectively. In monetary terms, the Civil, Structural, Architectural (“CSA”) element was highest representing €150m of the total €319m cost escalation.

3. There were no material changes to the vision for the NCH particularly in terms of physical footprint, building size and functionality from the time the original contract was awarded and the capital budget was approved up until the GMP process was completed. Notwithstanding this, the construction cost per sq. m increased significantly from circa €3,600 / sq.m to €5,600 / sq.m.
4. There was a considerable delay in development and finalisation of the design plans and this in turn delayed the agreement of the GMP.

In our opinion, while this delay did ultimately postpone the emergence of the cost escalation (or the point at which the escalation crystallised), the delay in itself was not a significant contributory factor in causing the escalation in costs.

6 REVIEW OF THE REPORTING OF THE CAPITAL COST ESCALATION

5. However, the consequences of the sudden and surprising cost escalation are very significant and in particular:
 - the capital cost budgeting process failed to determine and therefore secure the necessary capital budget at the commencement of this process.
 - because of the lack of early warning that the capital budget was under pressure, the NPHDB Executive were provided with little opportunity to manage or mitigate the cost escalation.
 - dealing with and managing the sudden cost escalation has diverted the attention / focus of the Board, NPHDB Executive and Design Team.
 - it has exposed the project to significant reputational risk.
6. The variation in costs only came to light because of the GMP process and in the normal course of events, the full extent of the cost escalation would probably only crystallise towards the end of capital construction works.
7. The sudden and surprising significant cost escalation may, for various reasons, have been primarily but not exclusively influenced by the following factors:
 - The capital budgeting process completed, which formed the basis of the €571m capital budget in the definitive business case, failed to properly estimate the likely future costs of the project within the stated contingency limits.
 - The cost assurance process and cost verification reports failed to identify what in retrospect appears to be shortfalls in the original cost estimation and capital budgetary setting process.
 - The savings planned to accrue from the value engineering project were significantly below target.
 - The ongoing capital budget or capital limit management activities in place in the period between the determination of the original budget and GMP finalisation, failed to highlight, on a timely basis, the incremental cost implications (where they existed) between the capital amounts / limits provided for in the original budget and the probable costs emerging from the developing plan.
 - Notwithstanding the good working relationship between the Design Team and the NPHDB Executive, the Design Team did not highlight or signal the looming capital budget overrun.

7 LESSONS LEARNED & PRELIMINARY RECOMMENDATIONS FOR CHANGE

The purpose of this section is to outline the key lessons to be learned based on our review and outline preliminary recommendations for change.

7.1 LESSONS LEARNED

On the basis of detail outlined in this report, it is clear that a number of the NCH capital project's fundamental systems and checks and balances failed to protect the Board from a large sudden increase in the cost of construction. The lessons to be learned, in so far as can be established in our limited review, cluster around the following themes:

- The cost estimation procedures used to produce the original capital budget estimates and to project possible savings did not serve their intended purpose.
- The cost verification review process which sought to provide additional assurance of the amount estimated and approved as a capital budget limit as appropriate, did not identify any underlying issues or concerns with the cost estimation amount, process and model.
- The ongoing cost management systems failed to properly capture a significant element of the capital budget implications of the developing design, contractor engagement and negotiations and evolving business environment until the contractor claims were received.
- The monthly cost trending reporting process failed to provide any early warnings of the looming cost escalation in the period from contract award to the commencement in April 2018 of the GMP process activities relating to the design deliverables and measurements.
- There are a number of factors which the Design Team stated should also be considered in assessing the lessons learned including:
 - A significant amount of unforeseen work and contractor engagement was required of the Design Team in order to finalise the contract, agree the VE objectives and agree the GMP.
 - The unforeseen and unexpected behaviour of the contractor in relation to GMP negotiations.
 - The inflationary construction environment during the time period between the estimation of original NCH capital budget and GMP determination
- A variance of this magnitude would also suggest that the interface and working arrangements between the Design Team, the Executive and the Board's governance of the project should be reviewed to determine the suitability and robustness of the oversight and governance activities entering Phase B.

Due to the limited nature of this review, we have not established the extent to which each of the items above contributed to the overall NCH capital cost variance.

7 LESSONS LEARNED & PRELIMINARY RECOMMENDATIONS FOR CHANGE

7.2 PRELIMINARY RECOMMENDATIONS FOR CHANGE

Before outlining draft recommendation for change, it should be noted that the challenges and operational environment of the project going forward, will in some respects, be fundamentally different as the project moves into phase B. In particular, the focus on design and value engineering will switch to construction management. The enormously time-consuming tasks of contract signing negotiations and GMP agreement will cease. The construction activities and monitoring of the GMP will need constant and active management going forward.

In the context of the NCH capital project's recent issues and future challenges, we would suggest that the recommendations for change in this section are considered by the Board.

1. The NCH capital project organisational structure should be reviewed and changed, where necessary, to ensure that the specific capital budgetary control systems properly operate in terms of design, process and reporting.

The responsibilities for the operations of this system should be crystal clear through the following governance levels:

- Board
- Nominated members of the Executive
- Senior nominated individual in the Design Team.

2. The Design Team should provide specific assurance in a suitable manner that the completed final design and GMP can deliver the NCH as specified by the end users and within the limit of agreed GMP.
3. The Design Team should outline the key processes, approach, methodology and reporting arrangements to ensure that all significant cost and capital budget implications of changes, problems and issues within the development, wherever they arise, will be immediately captured, considered and reported on a monthly basis.
4. The periodic cost trending reports completed by the Design Team should be reviewed and overhauled where necessary. In addition, a total cost to complete exercise for the NCH capital project should be completed, reported and reviewed on a quarterly basis. This cost to complete report should include all the key judgements, assumptions and calculations to the end of the project and specifically highlight any key changes from the previously issued report.
5. The KPI's for appropriate governance and oversight, both within the Design Team and between the Design Team and the Executive, should be reviewed and amended where necessary to provide a greater level of assurance that all is in order and provide early warning indicators or flags of possible concern.

7 LESSONS LEARNED & PRELIMINARY RECOMMENDATIONS FOR CHANGE

6. In addition, a considerable amount of work is well underway in reviewing and upgrading the Executive Management and Governance of the Board as it moves to Phase B. A detailed draft report has been completed on the Executive Management and Governance of the Board to support this review. We recommend that this draft report should be:
- Extended to include the specific roles and responsibilities of the Design Team
 - Reviewed in the context of the findings and the lessons learned during this cost escalation review
 - Considered, approved and implemented by the Board as a matter of urgency.