By email to: nwrp@water.ie

28 February 2021

National Water Resources Plan – Draft Framework Plan

In December 2020 Irish Water published its draft National Water Resources Plan (the dNWRP) for consultation and invited feedback. Kennedy Analysis has reviewed the dNWRP and welcomes the opportunity to comment.

Kennedy Analysis is supportive of a long-term national water resources plan: Ireland's water supply has been neglected for many decades and is in desperate need of an upgrade. However, we have concerns about many aspects of the dNWRP, including

(a) its inadequate leakage reduction proposals (which do not comply with international best practice),
(b) its inexplicable failure to contemplate a major mains replacement programme as a potential solution, and
(c) its failure to address Dublin's 99% reliance on surface-water sources.

Definitions used in our submission:
"dNWRP" = draft National Water Resources Plan
"Mld" = million litres per day
"SDB" = Supply/Demand balance
"GDA" = Greater Dublin water supply area
"SPP"= the proposed Shannon-to-Dublin Pipeline Project
"RC3" = Revenue Control 3
"CRU" = Commission for Regulation of Utilities (Irish Water's economic regulator)
"WRZ" = Water Resources Zone
"SELL" = Sustainable Economic Level of Leakage
"IBP" = international best practice
"DMA"= district metered area
"MRP" = mains replacement programme
"NYAA" = Normal Year Annual Average
"DYAA" = Dry Year Annual Average
"DYCP" = Dry Year Critical Peak
"WCP" = Winter Critical Peak
"WAFU" = Water Available for Use

SUMMARY

This is the first ever 25-year plan for Ireland's water supply. It is an opportunity to make decisions that would transform the water supply system into one that people can actually trust and rely on. The single biggest problem with water supply in Ireland is the decrepit pipes: the pipes are the root cause of unreliability and excessive leakage. **But, astonishingly, Irish Water's draft plan does not even include a major mains replacement programme as an option[i].**

It is a decade since Engineers Ireland stated in its "*State of Ireland 2011*" report that "*renewal of water pipe infrastructure is vital*" and it should be a "*national imperative*" that Ireland upgrade "*at least 1%, or more*" of the water pipes every year[ii]. But Ireland's pipes have never been replaced at a rate even close to 1% and Irish Water's plan is to continue with a rate of just 0.3% per year[iii]. This equates to a total replacement rate of just once every 333 years.

Leakage in Ireland is so bad that it constitutes, by far, the single biggest element of what Irish Water calls "demand". Well over 700 million litres of treated water are lost through network leaks every day. This is more than is used by all the households in Ireland put together (including household leaks). It is almost *double* the volume of water used by all of Ireland's industry (i.e. all the data centres, agriculture, factories, hotels, hospitals, breweries, industrial sites, offices and restaurants combined).

Reducing leakage not only reduces "demand": it creates the equivalent of an entirely new "source" of treated water that can be used by future new households and industry. And it is important to remember: since water recovered through cutting leakage is *treated* water, reducing leakage is the equivalent of developing a new raw water source *and* a new treatment plant.

Irish Water's plan for leakage in the next 25 years is the single most important aspect of the dNWRP. It is key for sustainability and will be the single biggest driver of whether Ireland has a water deficit or a water surplus in 25 years. Failure to properly address leakage will result in projects being undertaken to develop new raw water sources and increase treatment capacity that would otherwise not be necessary – yet **Irish Water's leakage reduction targets in this plan are extremely unambitious and do not comply with international best practice, as is shown in detail in our submission.**

The plan also fails to address one of the Ireland's biggest vulnerabilities: Dublin's current 99% reliance on river water for its water supply (most of which is classified as "S3" water, the most vulnerable type of all). This is far from international best practice and leaves Dublin badly exposed. **Providing Dublin with some diversification protection should be a priority for this 25-year plan – but it is not addressed in the dNWRP at all.**

---

[i] https://www.water.ie/projects-plans/our-plans/nwrp/NWRP-Draft-Framework-Plan.pdf See table 8.3 which sets out all of the options that Irish Water plans to consider to address future water needs: a major mains replacement programme is not even on the list.

[ii] https://www.engineersireland.ie/LinkClick.aspx?fileticket=XIOWhReG3xs%3d&portalid=0&resourceView=1

[iii] https://www.cru.ie/wp-content/uploads/2019/07/CRU19148-Irish-Water-Revenue-Control-3-Decision-Paper.pdf This is the CRU decision concluding the RC3 process. Page 7/8 shows that the 2020-2024 target for "new mains" is 424km and for "rehabilitated/lined mains" is 461km (totalling 885km out of Ireland's 65,000km of mains), i.e. 1.4% over 5 years, or 0.27% per year.

This draft plan (like many Irish Water reports) sounds good on a high-level read:

(i) it claims to adopt "ambitious" leakage targets,
(ii) it purports to be built around appealing slogans like "use less, lose less, supply smarter",
(iii) it insists that it uses nothing but "international best practice" for its methodologies and that it relies on the best and latest data.

However, in order to really understand what Irish Water is proposing, it is necessary to read the entire 178-page report and its 14 appendices (some of which are long and technical) and do a lot of cross-referencing (it is not an easy report to read). It requires a considerable amount of work and a reasonable knowledge of water supply to be able to scratch the surface and discover that, in fact:

(i) the leakage targets in this 25-year plan are actually very unambitious,
(ii) the slogans do not translate into reality in the detail of the report,
(iii) the report is inconsistent, contradictory, cites old data (when more recent data is available), and many of the key calculations are based on methodology that is *not* international best practice.

We have identified error after error in this report. The impact of these errors on the predicted water deficit will vary from region to region - but every one of them, without exception, results in an *over-statement* of the predicted water deficit for the Greater Dublin Area (the GDA). This is significant given the backdrop: **this plan sets the stage for the advancement of Irish Water's proposed Shannon-to-Dublin water pipeline.**

Naturally, a project of the scale and expense of the proposed Shannon pipeline would not even be a consideration unless a large water deficit were identified for the GDA. If the use of inappropriate data/methodology results in the prediction of an overstated water deficit for the GDA then the Shannon pipeline may be considered a feasible solution on the basis of a *false premise*. This would risk taxpayers' money being spent on an *unnecessary* project that would not even address Dublin's main problems: its unreliable pipes and lack of diversification.

The dNWRP is an important moment: it is a blank canvas. It should herald a new approach to water supply in Ireland. It should set the foundation for a reliable, sustainable and secure water supply that people can trust and rely on for decades to come.

Ireland needs a major mains replacement programme. This will cost billions of Euros. Failure to undertake this now will result in billions of Euros being spent on projects to develop new raw water sources that would otherwise be unnecessary. It would be a false economy: a major mains replacement programme akin to those undertaken in the UK two decades ago will become unavoidable in the coming years in any event.

The Greater Dublin Area is heavily reliant on S3 river water. It badly needs diversification protection. The Greater Dublin Area is the biggest water resource zone in Ireland with a population heading towards 2million people. This must be a priority in the dNWRP.

Please take the time to read our detailed submission and contact us for more information at Emma.Kennedy@KennedyAnalysis.com

PART 1:
GLARING ISSUES AND OVERSIGHTS IN THE dNWRP

(a) The dNWRP contains unambitious leakage targets that are not in line with international best practice

Note: as set out in Part 4(a) below, the dNWRP is inconsistent in its reporting of the base year (2019) leakage level - it cites three different figures in three different parts of the report. Not one of those three figures correlates to the official 2019 leakage (as reported by the CRU) which is 712Mld[iv]. It is, naturally, our assumption that the CRU figure is correct so this submission assumes 712Mld as the level of 2019 (base year) leakage.

Leakage is by far the single biggest element of "demand": the dNWRP plan for leakage in the next 25 years is the biggest driver of whether a WRZ will have a 2044 "deficit" or "surplus"

Ireland's leakage is reported at 43%. This is among the highest in the world[v].

Ireland's leakage has been increasing year on year for as long as we are able to obtain data, up until 2019 (bar the occasional year when it was flat/reduced by a very small margin). Irish Water states that leakage went *down* in 2019 (to 43%) – and it broadcast this statement widely. However, it is important to be aware that most (if not the entirety) of that apparent 'reduction' in leakage from 2018 and 2019 was driven by a narrowing of the definition of "leakage" by Irish Water in 2019. Significant volumes of water that had previously been reported as leakage were "recategorised" in 2019 and are now reported within domestic demand/non-domestic demand or as newly created elements of "demand"[vi]. *Note: based on the limited data that has been published regarding this "recategorisation" we calculate that, if leakage in 2019 had been reported on the same basis as 2018, (i) for Ireland overall, it is almost certain that 2019 leakage would have been higher than 2018 leakage, and (ii) for the GDA (Greater Dublin Area) specifically, it is certain that 2019 leakage would have been higher than 2018 leakage. We have asked Irish Water to provide like-for-like leakage*

[iv] There are many examples of the CRU reporting 2019 leakage at 712Mld – for example:
- https://www.cru.ie/wp-content/uploads/2020/08/CRU20089-Energy-and-Water-Monitoring-Report-for-2019.pdf
- https://www.cru.ie/wp-content/uploads/2020/12/CRU20143-RC3-Financial-Incentives-Non-Domestic-billing-and-Leakage-CRU-Consultation-Paper.pdf
- https://www.crf.ie/wp-content/uploads/2021/01/CRU20119-Irish-Water-Performance-Assessment-Framework-Review-Consultation-Paper.pdf

[v] Ireland's leakage (not including *any* household leakage or leakage from customer supply pipes) is reported at **43%**. The 2017 KPMG "*City Benchmarking*" study (which looked at water leakage in 35 cities from countries across the world including Nigeria, South Africa, Uganda, Brazil, Colombia, Poland, Russia, Albania, Bulgaria, the UK and Northern Ireland) found that "*the average city loses between **10% to 13%** of water to leakage and other non-revenue sources*".

[vi] The CRU's "*Irish Water Capital Investment Plan 2017 to 2021 Monitoring Report No. 3*" (published 10/07/20) states: "*For 2019, Irish Water has made some changes to how it is reporting water losses to the CRU. An estimate of the water used by Irish Water in its own buildings and treatment plants has been included in the non-domestic demand figures. An estimate of the water used by fire services, other unbilled use and water used at connections that are not recorded on Irish Water's system have been removed from unaccounted-for-water and are now reported as unrecorded use. Under-recorded use at homes and businesses, resulting from old and broken meters and data errors, has also been removed from unaccounted-for-water and is now included in the domestic and non-domestic demand figures, respectively. A full breakdown of these categories will be provided in future reports*".

data for 2019 (i.e. leakage data for 2019 calculated in line with the way that leakage was reported up to 2018) to verify our findings, but Irish Water has not provided this.

It is also important to remember that this 43% only covers network leakage (it does not include household leakage or leakage from customer supply pipes). This reporting approach is different to the UK where "leakage" (which is, on average, 20%[vii]) *includes* losses from customer supply pipes. The UK states that almost 25% of its leakage is made up of customer supply pipe losses[viii] so, when they are presented on a like-for-like basis (in accordance with Irish Water's definition) UK leakage is 15% compared to Irish Water's 43%.

Leakage is reported by Irish Water as part of "demand", so an increase in leakage translates to an increase in demand, and vice versa. "Demand" can be broken down into several elements which are analysed separately for the purposes of supply demand balances: leakage, domestic demand and non-domestic demand are the three largest elements of demand. Leakage is by far the largest of the three.

Leakage is by far the single biggest element of "demand".

- More treated water is lost through leaks than is used by every household in Ireland combined (including household leakage).
- More treated water is lost through leaks than is used by all of Ireland's industry combined (i.e. all of Ireland's data centres, restaurants, factories, breweries, offices, agriculture, hospitals etc).

It is important to remember that water wasted through leaks every day is not *raw* water: it is water that has been extracted from a raw water source, pumped to a water treatment plant, and treated (at considerable expense) before being put into the supply system where it is then lost. As such, reducing leakage equates to the creation of (i) a brand new raw water source, and (ii) additional water treatment capacity.

The approach taken to leakage for the next 25 years is the single most important aspect of the dNWRP: it is the biggest driver of whether there will be a water *deficit* or *surplus* in 2044.

Short term leakage reduction target (next 5 years)

Irish Water has just completed its third "revenue control" process with the CRU (known as RC3). This was a long process during which Irish Water submitted a business/investment plan with its proposed leakage reduction target. The CRU considered the target (a reduction of 176Mld from the 2019 base year level of 712Mld[ix]) and it was publicly consulted upon. After a complex 18-month

[vii] https://nic.org.uk/app/uploads/NIC-Preparing-for-a-Drier-Future-26-April-2018.pdf (see page 11)

[viii] https://www.ofwat.gov.uk/wp-content/uploads/2019/12/PwC-%E2%80%93-Funding-approaches-for-leakage-reduction.pdf (see page 17)

[ix] https://www.cru.ie/wp-content/uploads/2020/12/CRU20143-RC3-Financial-Incentives-Non-Domestic-billing-and-Leakage-CRU-Consultation-Paper.pdf (see page 26: "*Irish Water reported its leakage level ('Unaccounted-for-water') at 712 million litres a day in 2019. As part of its RC3 capital investment plan, Irish Water intends to reduce net leakage by 176 million litres a day by the end of 2024*").

process the CRU finally confirmed the 176Mld leakage reduction target (for the 5-year period from 2020 to 2024) in its final decision in August 2020[x]. This target was reported in the press[xi].

The target set by the CRU amounted to a 25% leakage reduction over 5 years (176Mld as a percentage of 712Mld is **25%)**. This was an appropriately ambitious target given the high level of leakage in Ireland, and was in line with the targets set by the UK water regulator for under-performing UK water suppliers.

It goes without saying that Irish Water's dNWRP cannot be drafted in a vacuum. It must take account of targets that have already been agreed between Irish Water and its regulators in advance of its publication. **The 176Mld leakage reduction target should, therefore, be reflected in the dNWRP.** This obvious fact is stated explicitly in the UK Water Resources Planning Guidelines (which Irish Water claims, in the dNWRP, to be following) which state that water suppliers' forecasts of leakage reduction in their water resources plans "*should be consistent with the data they include in the business plan they provide to [their economic regulator] as part of its price review process*"[xii].

However, the dNWRP does *not* reflect that 176Mld leakage reduction target. The dNWRP proposes that, by 2024, leakage will have been reduced to 698Mld[xiii] . This equates to a leakage reduction of just 14Mld from a 2019 baseline level of 712Mld i.e. a 5-year leakage reduction target of just 2%[xiv].

The dNWRP adopts a 5-year leakage reduction target of just 2% (instead of the 25% leakage reduction target just set by the CRU).

To summarise:

- the CRU has just set Irish Water a **25%** leakage reduction target for the 2020-2024 period
- that 25% leakage reduction target should be reflected in the dNWRP
- the dNWRP does *not* reflect that leakage reduction target and, instead, adopts a **2%** leakage reduction target for the 2020-2024 period.

This is unacceptable, not IBP and cannot be allowed to stand.

Long term leakage reduction target (2044)

The dNWRP proposes to use the "sustainable economic level of leakage" (SELL) as its long-term leakage target.

---

[x] https://www.cru.ie/wp-content/uploads/2020/08/CRU20085-Update-to-Irish-Water%E2%80%99s-Revenue-Control-3-RC3.5%E2%80%93-Irish-Water%E2%80%99s-Updated-Capital-Investment-Plan.pdf (see page vii)
See also: https://www.cru.ie/wp-content/uploads/2020/12/CRU20143-RC3-Financial-Incentives-Non-Domestic-billing-and-Leakage-CRU-Consultation-Paper.pdf (see page 26: "*Irish Water reported its leakage level ('Unaccounted-for-water') at 712 million litres a day in 2019. As part of its RC3 capital investment plan, Irish Water intends to reduce net leakage by 176 million litres a day by the end of 2024*")

[xi] https://www.businesspost.ie/ireland/irish-water-urged-to-cut-leakage-loss-by-176-million-litres-a-day-351fcee0

[xii] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/903694/Water_resources_planning_guideline.pdf (see page 77).

[xiii] https://www.water.ie/projects-plans/our-plans/nwrp/NWRP-Draft-Framework-Plan.pdf - see page 74.

[xiv] 14Mld as a percentage of 712Mld is **2%.**

SELL is a concept that used to be used in the UK for the setting of leakage targets, but which the UK regulator (OFWAT) recently said should no longer be used because it does not encourage sufficient ambition in leakage reduction. Indeed, the historic use of SELL is widely blamed for the stagnation in leakage reduction in the UK over the past 2 decades. This move away from SELL was a high-profile change and was reported widely in the UK water industry press.

The calculation of SELL is very complex (the dNWRP states that *three* sets of consultants have been involved in the calculation of SELL so far and it requires a 52-page appendix to the dNWRP just to explain the process). SELL relies heavily on a long history of reliable water data. This in itself makes it an inappropriate method for Irish Water to be adopting at this stage – Ireland simply does not yet have a long history of reliable water data. Indeed, the quality of Irish Water's historic data is still so poor that the calculation of SELL had to resort to the use of a *generic UK model* using *generic UK data* rather than relying on the inadequate Irish data (for full details of this see Appendix 1). This alone should indicate that SELL is not the appropriate method to be using in Ireland at this stage.

However, the dNWRP justifies its proposed use of SELL on the (incorrect) basis that SELL is still the approach used in the UK[xv]. This is out of date. Up until the 2014 "price review" process (known as PR14) OFWAT *did* set leakage reduction targets based on SELL but, since the 2019 PR19, it has *not* done so. Upon adopting this significant change in approach, OFWAT stated: "*Leakage targets and performance commitments have historically been set in relation to the sustainable economic level of leakage (SELL). However, we, the Environment Agency (EA) and Natural Resources Wales (NRW) are concerned that SELL is not driving companies to become more efficient in how they tackle leakage"*[xvi]

Instead, OFWAT now adopts a much simpler method: it sets leakage reduction targets for the water suppliers as an *absolute* target, expressed as a percentage (for example, for the upcoming 5-year period, Thames Water is required to reduce its leakage by 20.4%).

OFWAT's change in approach was described by RPS Group (in an article titled "*Prevention is better than cure in tackling UK water leakage rates*", which advocates for mains replacement programmes as the most sustainable long-term solution for leakage reduction) as *"the biggest shake-up in leakage-management for some time"*[xvii].

The most important point, as far as this relates to the dNWRP, is the *reason* for the change: OFWAT stopped using SELL for leakage targets because it did not encourage sufficient ambition in leakage reduction. It said: "*Historically, leakage targets … were informed by SELL… we are concerned that this approach has not driven sufficient efficiency improvements or innovation… SELL tends to maintain the status quo…SELL, as an approach, allows for leakage to increase when new resources are built because the value of reducing leakage decreases as more water is available*"[xviii]

[xv] The dNWRP states, at page 71: "*In the UK, the industry regulators for water supply set leakage reduction targets for the individual water utilities based on SELL. As our Framework Plan has been developed based on UK water resources planning guidelines, the forecast for leakage reduction has been SELL*".

[xvi] "*Delivering water 2020 - consulting on our methodology for the 2019 price review*" published by OFWAT in July 2017.

[xvii] https://www.rpsgroup.com/insights/water/prevention-is-better-than-cure-in-tackling-uk-water-leakage-rates/

[xviii] "*Delivering Water 2020: Our methodology for the 2019 price review*" published by OFWAT on 13 December 2017.

Indeed, the use of SELL has been widely blamed for the stagnation in leakage reduction in the UK for the last two decades. For example, a 2019 PWC report stated: "*As can be seen since 2002 leakage levels have declined at a considerably slower rate. Part of the reason driving this trend was the use of the SELL measure to determine leakage performance commitment levels in the past… the company-derived SELL approach has failed to drive efficiency improvements or innovation in leakage reduction*"[xix] and an important 2018 NIC report stated: "*Water companies reduced leakage considerably in the late 1990s, but since 2000 levels have stabilised, possibly because decisions were based on a 'sustainable economic level of leakage'*"[xx].

OFWAT's new position has naturally been reflected in the most recent UK Water Resources Planning guidelines (which supersede the 2016 version cited in the dNWRP). They state: "*previously, companies have used the sustainable economic level of leakage method to determine levels of leakage. However, this is no longer acceptable for use in WRMPs*".

Naturally, the old SELL data may still be valuable to UK water suppliers - it may even be used as background information to help determine the appropriate percentage reduction target. Similarly, for Irish Water, the process of determining Ireland's SELL may be a beneficial exercise to carry out in the background, particularly given the amount of work and money that has already gone into the process. However, it would be entirely inappropriate, in light of the recent developments in the UK (in particular its finding that SELL does not encourage sufficient ambition in leakage reduction), for Irish Water to adopt SELL for its long-term leakage target in the dNWRP.

The dNWRP must *not* use SELL for its long-term leakage targets: this is no longer considered best practice in the UK because it failed to encourage sufficient ambition in leakage reduction – indeed, the use of SELL has been widely blamed for the stagnation in leakage reduction in the UK over the past two decades.

The dNWRP should adopt the new UK approach and set long-term leakage targets by reference to an absolute reduction target, expressed as a percentage e.g. "*over the next X years Irish Water will reduce leakage by Y% which amounts to a reduction in absolute terms of ZMld".*

To determine the appropriate reduction target Irish Water should:

(i) refer to leakage reductions achieved elsewhere in recent years (for example, leakage in England and Wales was cut by 37% in just 6 years from 1995 to 2001 as a result of major mains replacement programme),

(ii) consider the most effective and sustainable approach for achieving a step-change in leakage (a mains replacement programme should be top of the list - see part 1(b) below),

(iii) bear in mind that Ireland's leakage levels are among the highest in the world – its leakage reduction targets need to be appropriately aggressive to address this.

[xix] "*Funding Approaches for Leakage Reduction*" (a report produced for OFWAT by PWC published in December 2019) https://www.ofwat.gov.uk/wp-content/uploads/2019/12/PwC-%E2%80%93-Funding-approaches-for-leakage-reduction.pdf

[xx] National Infrastructure Commission, "*Preparing for a Drier Future*, April 2018 https://nic.org.uk/app/uploads/NIC-Preparing-for-a-Drier-Future-26-April-2018.pdf

In its initial response to us Irish Water *denied* that the UK no longer uses SELL for leakage targets and stated that it will *not* update the dNWRP to address this issue

During the consultation period for the dNWRP (before we drafted this submission) we flagged to Irish Water that its use of SELL for long-term leakage targets was inappropriate.

Irish Water's response to us was as follows: *"SELL has not been abandoned in the UK. Many UK water utilities still assess it and use it to set targets in accordance with the obligations imposed by OFWAT. Water utilities that have approached or achieved SELL have had other targets imposed by OFWAT, but none have had those targets set before they are very close to or have achieved SELL."*

This is an astonishing response from Irish Water. It is an undeniable fact that OFWAT no longer uses SELL for leakage targets in the UK: it now sets leakage targets by reference to an absolute percentage reduction *because it considers that SELL is an inappropriate and insufficiently ambitious target*. This was a major industry change. The evidence of it is set out in detail (with full references) above. It is possible (as we stated above) that SELL still *informs* the target set by OFWAT, but the use of SELL for leakage targets themselves is no longer the approach adopted in the UK. We invite Irish Water to provide evidence to back up its final statement "*Water utilities that have approached or achieved SELL have had other targets imposed by OFWAT, but none have had those targets set before they are very close to or have achieved SELL".* This implies that some water utilities did *not* have a percentage-reduction target imposed in PR19, or that OFWAT adopted its new method for setting leakage targets simply because every water supplier had already achieved (or almost achieved) the SELL target: this is simply not correct.

In terms of the appropriate approach for water resources management plans themselves, it has also been stated explicitly (in the latest UK "Water Resources Planning Guidelines", which supersede the 2016 version cited in the dNWRP) as follows: "*previously, companies have used the sustainable economic level of leakage method to determine levels of leakage. However, this is no longer acceptable for use in WRMPs".* This could not be clearer: it is not appropriate for Irish Water to use SELL for its leakage targets in its dNWRP.

Irish Water's response to us went on to state: *"We have had to develop a plan that is specific to the circumstances of Ireland's public water supply. SELL is an appropriate basis to set an initial target for Irish Water. Among other things, it requires Irish Water to develop methodologies and improve data collection in order to calculate environmental, economic and social costs arising from achieving a SELL target. That provides a transparent way for the public to see, understand and comment on the rationale for Irish Water's leakage reduction target, enhancing the public participation in the consultation process."*

Again, this is impossible to accept. Of all long-term leakage target methodologies to adopt for Ireland, SELL (which is heavily reliant on a long history of historic data) is possibly the least appropriate – Irish Water's own data is so inadequate that its SELL analysis had to resort to the use of a *generic UK formula* using *generic UK data*. In terms of the value of calculating SELL behind the scenes, and using it to help identify data that would be useful for Irish Water to have, we agree (as stated above) that the process of assessing SELL may still be worthwhile (particularly given the amount of work and money that Irish Water has put into the process already). But to use SELL itself as the long-term leakage target for Ireland would be entirely inappropriate. The notion that SELL is in any way "*transparent*" to the public, or that it allows them to "*see, understand and comment on*

the rationale for Irish Water's leakage reduction target, enhancing the public participation in the consultation process" is unsupportable. SELL is an exceptionally complex concept. The SELL Appendix is long, technical and would be inaccessible to all but a tiny proportion of the public. On the other hand, an absolute reduction target is simple, measurable and accessible for all members of the public.

Irish Water's response went on to state: *"Irish Water's National Water Resources Plan will be reviewed and revised every five years. Leakage targets will be reviewed as part of each cycle. As targets are achieved, revised targets will be set*."

Irish Water's response implies it might move away from the use of SELL in a *future* iteration of the NWRP, but that it will stick with its proposed use of SELL for *this* iteration. This is invalid for two reasons:

(i) it is highly likely that key decisions in terms of future strategic projects will be made within the next 5 years. Some of these (such as the proposed Shannon pipeline project) would be enormously expensive. It is vital that they are not made on the basis of inappropriate methodology that is not considered international best practice. <u>They must be made on the basis of appropriate long-term leakage targets set in accordance with international best practice.</u>

(ii) The dNWRP is the first step in a major, high-profile, multi-billion-Euro, nation-wide plan. We have brought to Irish Water's attention that one of the most important elements of that plan is not in line with international best practice. To suggest that it might take account of this in a *future* iteration of the plan (but that it will not take account of it now) makes a mockery of the public consultation process. This is the very purpose of public consultation: to identify shortcomings and to address them. The plan is still a draft. <u>Why, if it knows now that its long-term leakage target methodology is no longer considered international best practice, would Irish Water launch a major project on the basis of that methodology?</u>

****For our assessment of the SELL analysis in Appendix H to the dNWRP please see Appendix 1.****

(b) The dNWRP does not even contemplate a major mains replacement programme as a solution – this is a glaring oversight

The value of mains replacement programmes

It is increasingly recognised internationally that, in countries where the pipes are in poor condition, mains replacement programmes (MRPs) are the most sustainable long-term solution for water supplies[xxi]. It is widely accepted that find-and-fix generally cannot achieve a step-change in leakage levels. If a step-change in leakage is required (as is the case in Ireland) a MRP should be considered.

The key benefits of mains replacement are

(i) offsetting asset deterioration and improved reliability (i.e. the pipes are less prone to bursts),
(ii) improved water quality, and
(iii) leakage reduction.

However, the benefits of MRPs are much wider. For example, they allow for redress of "mixed pipe systems" like that in Ireland where the pipe system has developed organically over hundreds of years, resulting in pipes of different materials joining directly to one another – for example, cast iron Victorian-era pipes joining to poor quality PVC pipes joining to asbestos cement pipes, all of which are deteriorating at different rates and respond differently to external pressures such as frost heave. This means that bursts and cracks at the joints is a real problem – Irish Water itself has said "*leakage is endemic in mixed pipe systems".* Ireland also has a particular problem with connection pipes, as historically many of these were laid at very shallow depths so are prone to frost damage. The only way to address the root of this problem is to undertake a wholesale replacement of the pipes, one localised region at a time, and replace them all with pipes of one material.

PWC recently observed: *"Mains replacement, while relatively expensive in the short-term, can help deliver better value for money than reactive strategies like [find-and-fix], as a 'spend to save' initiative that reduces maintenance costs for the majority of the life of the asset and contributes to reducing leakage. The potential benefits of longer-term investment from increasing the resilience of the asset base, e.g. to extreme weather conditions, should also be taken into account"*[xxii].

Mains replacement programmes in the UK

In the UK in the '90s/'00s (shortly after privatisation of the UK water supplies, when public eyes were sharply focused on water supplier performance) major MRPs were undertaken. The UK MRPs were undertaken primarily to address (i) "serviceability" (i.e. to reduce pipe bursts/failures due to old and deteriorating pipes) and (ii) water quality. They improved the reliability of the pipes and reduced their average age. Naturally, the MRPs also had a huge impact on leakage levels - leakage in England and Wales dropped by 37% in 6 years (from 1995 to 2001)[xxiii].

During its MRP London replaced up to 3% of its water pipes per year (note: when we stood in front of the relevant Joint Committee alongside Irish Water in April 2018 to discuss the proposed

[xxi] For example, https://www.rpsgroup.com/insights/water/prevention-is-better-than-cure-in-tackling-uk-water-leakage-rates/

[xxii] https://www.ofwat.gov.uk/wp-content/uploads/2019/12/PwC-%E2%80%93-Funding-approaches-for-leakage-reduction.pdf (see page 12)

[xxiii] https://www.gov.uk/government/publications/water-and-treated-water/water-and-treated-water

Shannon-to-Dublin pipeline project, Irish Water told the Joint Committee that London had never replaced more than 1.3% of its pipes in one year – this was wrong and we have sent the evidence to prove it to the Joint Committee[xxiv]). It did this by replacing all of the pipes in one entire DMA (district metered area) at a time - to get a sense for the scale of a DMA, there are 749 DMAs in Dublin. This allowed it to localise disruption, realise economies of scale (the cost per meter of replacing 500m of pipes is significantly lower than replacing 5m due to fixed cost overheads etc), rationalise the layout of the pipe network (and reduce its overall length - the overall length of pipes was cut by an average of 20% per DMA) thus reducing future maintenance costs, and eliminate the "mixed pipe" problem by replacing the entire DMA with pipes of one material of the same age that responds to external pressures in the same way.

The London MRP achieved its purpose. Again, Irish Water suggested to the Joint Committee in April 2018 that the London MRP had been a failure - this was not the case, as can be observed from reading the Independent Review of the London mains replacement programme[xxv] which concluded that the programme had been the right course of action for addressing the issues it set out to address and that, following the MRP, Thames Water (i) recovered its position on watermains deterioration to "stable", and (ii) not only *met* its leakage targets: it outperformed them.

After the MRPs ended the UK reverted to a primarily find-and-fix approach. Mains replacement rates reduced significantly (they are now down to around 0.6% per annum). For the past decade, since find-and-fix has been the primary leakage-reduction strategy, leakage levels in the UK have plateaued with nothing like the reductions that were achieve in the '90s/'00s. Commentary on the impacts of the MRPs is clear: while leakage reduction was generally not the primary purpose of the programmes, they effected a step-change in leakage in England and Wales which simply could not have been achieved through find-and-fix and which has not been replicated since the programmes ended. The Independent Review noted that it is very difficult to effect large reductions in leakage through find-and-fix: "*Typically [find-and-fix] is used to manage the Natural Rate of Rise. Increasing [find-and-fix] activity can marginally reduce leakage levels, but generally will not deliver large reductions cost effectively".*

It is important to remember that the water supplies in England and Wales were privatised in 1989 and naturally the interests of shareholders (whose investment timeframes can be short/medium term) are not always aligned with the interests of the supply system (which needs investment for long-term benefits). OFWAT sets limits on the amount of investment in new pipes that can be charged to customers through bills - it expects shareholders to shoulder some of the burden. This conflict is often raised in the UK press, calling for higher levels of investment in the pipes, and this broad issue was flagged in the recent important EFRA committee report[xxvi], which ultimately called for an independent review of the way the UK water industry is regulated.

[xxiv] In summary: Thames Water operates 31,411km of pipes, of which 56% (17,600km) are in London; in the year 2007/8 Thames Water replaced 631km across its entire network including 527km in London – this amounts to 3% in that one year alone.

[xxv] *"Thames Water Mains Replacement Programme Independent Review - Findings and Recommendations Report*" (02 July 2012) produced by Black & Veatch for Thames Water and OFWAT.

[xxvi] "*Regulation of the Water Industry*" (8 October 2018) a report from the EFRA committee (the committee of DEFRA, the relevant UK government department).

Ireland's need for a mains replacement programme

The most obvious indicator of the state of Ireland's pipes is the very high leakage levels. However, pipes as poor as this also create serious issues for water quality, with high background leakage (through countless tiny cracks that are impractical to address through find-and-fix), a high "natural rate of rise" of leakage, and a high vulnerability to sudden new cracks/bursts when the pipes comes under pressure from shifting ground during a cold snap/dry spell (often resulting in water shortages and outages as water treatment plants struggle to keep up with the surge in leakage).

It is a decade since Engineers Ireland stated in its "State of Ireland 2011" report that "*renewal of water pipe infrastructure is vital*" and that it should be a "*national imperative*" that Ireland upgrade "*at least 1%, or more*" of the water pipes every year[xxvii]. However, Ireland's pipes have never been replaced at a rate even close to 1% and Irish Water's plan (for the period 2020-2024) is to continue replacing pipes at a rate of just 0.3% per annum[xxviii]. This equates to a total replacement rate of just once every 333 years. This is entirely inadequate for Ireland, where some pipes are already 160 years old and the average is 65-85 years. It is important to note: the useful life of water pipes is generally considered to be 80-100 years.

A recent major project, commissioned by the UKWIR on behalf of the UK water industry and led by Servelec Technologies, undertook what was described as "*pioneering asset management research*" through a project called "*Long-term Investment in Infrastructure*". The project assessed whether current UK replacement rates are sufficient to offset the natural deterioration of the pipe system over the next 50 years. The project was high profile, generating significant industry press. Its key finding was that even though the UK pipes are currently considered to be in a "reasonable" state, the current mains replacement rate in the UK is low (at 0.6% per annum) and insufficient. Unless it is increased, the pipes will begin to fail more often. It needs to be doubled to 1.2% per annum in the short term (2020-2030) and to 1.3% in the long term (from 2030-2070). It flagged that the current UK replacement rate is similar to rates in Europe, despite parts of Europe having much younger pipes[xxix]. *Note*: The average age of pipes in the UK is currently around 55 years - the EU average is around 36 years (and, as noted above, Ireland's pipes are an average of 65-85 years old).

This would suggest that the mains replacement rate in Ireland needs to be well over 1.3% per annum just to offset the natural deterioration of the pipes (and Ireland can't afford to just achieve that - it needs to *improve* the state of the pipes, not just maintain their current state).

It is hard to see how Irish Water's current approach of sticking with find-and-fix as its primary leakage reduction method and not undertaking any major mains replacement programmes (which is reflected in the dNWRP) will not have serious implications for Ireland's water pipes. There is an ever-growing risk of major outages/floods caused by large mains bursts and pipe failures. Additionally, as identified in the UKWIR project referenced above, a stitch in time saves nine: *delaying* the necessary mains renewal and allowing the situation to deteriorate yet further

---

[xxvii] https://www.engineersireland.ie/LinkClick.aspx?fileticket=XIOWhReG3xs%3d&portalid=0&resourceView=1

[xxviii] https://www.cru.ie/wp-content/uploads/2019/07/CRU19148-Irish-Water-Revenue-Control-3-Decision-Paper.pdf
This is the CRU decision concluding the RC3 process. Page 7/8 shows that the target for "new mains" is 424km and for "rehabilitated/lined mains" is 461km, totalling 885km out of Ireland's 65,000km of mains, i.e. 1.4% over the next 5 years (2020-2024) or 0.27% per year.

[xxix] Download the presentation here: https://ukwir.org/workshop?object=172263&daf=1

will make it *even more expensive* to recover the position in the future, compared to addressing it now.

The dNWRP does not even contemplate a major mains replacement programmes as a solution for Ireland

Table 8.3 of the dNWRP sets out the options that Irish Water will consider for regions where it predicts there will be a water deficit in the future. It does not even contemplate a MRP as one of its potential solutions. Instead, the dNWRP proposes ongoing reliance on find-and-fix as the primary tool for addressing leakage. This is a glaring oversight for a 25-year plan in a country where leakage is the single biggest element of demand and the water pipes have been neglected for decades.

Ireland needs to do what the UK did 20 years ago: undertake an ambitious mains replacement programme to effect a step-change in the water supply system. Yet it appears that, for an unfathomable reason, Irish Water is not supportive of major mains replacement programmes (MRPs). Its comments to the Joint Committee in 2018 (when it was attempting to justify its proposed Shannon pipeline project) downplayed the value of mains replacement – yet much of the data that it cited was incorrect/extremely misleading. Irish Water points to the disruption (to traffic etc) of a MRP – yet it is widely acknowledged that the opposite is true: undertaking a wholesale replacement of all of the pipes in one DMA at a time localises disruption to one region and *reduces* disruption in the medium- and long- term. *Replacing* pipes (rather than simply patching them up through find-and-fix) means that they need less maintenance and are less likely to burst in the future i.e. less drilling up the same stretch of tarmac to do repairs (and consequently less social disruption/diverting of traffic/noise/pollution etc) - remember, Irish Water says that "*pipe replacement is about the replacement of pipes that are rotten or effectively failing all the time*" and that it generally waits until a pipe is bursting "*three to four times a month*" before it replaces it (these were Irish Water's own words to the Joint Committee in April 2018[xxx]).

Drilling up the same stretch of tarmac three or four times in a month is highly disruptive.

A major MRP should be top of the list of potential solutions for Ireland's water supply problems in the dNWRP – yet it is not even on the list. A major MRP would cost billions of Euros but it is the most sustainable solution for many of the major problems in Ireland's water supply and it will become unavoidable in the coming years regardless.

Failure to contemplate a major MRP as a solution within the dNWRP is incomprehensible. It also sets the landscape for the potential selection of other solutions (such as the proposed Shannon pipeline project) that would be *unnecessary* if a major MRP was undertaken. This short-sighted approach will not deliver a sustainable water supply and is a potential waste of scarce financial resources.

[xxx] *https://data.oireachtas.ie/ie/oireachtas/debateRecord/joint_committee_on_housing_planning_and_local_government/2018-04-25/debate/mul@/main.pdf*

(c) The dNWRP fails to flag Dublin's 99% reliance on river water as a key issue to be addressed

Surface water sources (primarily rivers) are the single most vulnerable type of water supply. They are particularly exposed to giardia[xxxi], cryptosporidium[xxxii] and THMs[xxxiii]. Water that is extracted from close to the mouth of the river (having passed through cities/industrial areas/agricultural areas/wastewater treatment plants etc on its journey) is particularly vulnerable. S3 water is considered the "*highest risk category for a surface water source*"[xxxiv]. Its potential for contamination is high and if something goes wrong in the treatment process (which, with the best will in the world, things sometimes do[xxxv]) then the risk to public health is high. This is exactly what happened at Leixlip in 2019: Leixlip was extracting vulnerable S3 water from the Liffey[xxxvi] and, after failures in the treatment process, 600,000 people were put on a "boil water notice" due to the risks of giardia and cryptosporidium in the water (in one incident) and high turbidity (in the other) – both of these are peculiarly *river water* risks.

After the 2019 Leixlip incidents several Joint Committee meetings were held to discuss what had caused the problems. One of the points that was made repeatedly was that the water extracted from the Liffey for treatment at Leixlip was "*right up there*" in terms of being the most "*at-risk water supply*" because it is taken from a lowland location at the back end of a catchment close to

---

[xxxi] "… where raw water is abstracted from a source such as the River Liffey that has the potential to be contaminated with cryptosporidium, giardia or other parasites" https://www.oireachtas.ie/en/debates/debate/joint_committee_on_housing_planning_and_local_government/2019-11-05/3/

[xxxii] "*Bacteria from animal or human waste and parasites such as Cryptosporidium and Giardia are commonly found in open water bodies*" https://data.oireachtas.ie/ie/oireachtas/committee/dail/32/joint_committee_on_housing_planning_and_local_government/submissions/2019/2019-11-05_opening-statement-niall-gleeson-managing-director-irish-water_en.pdf

[xxxiii] Irish Water Performance Assessment Report February 2018: "*THMs are predominantly formed by the reaction of chlorine (used to disinfect the water) with natural organic substances that may be present in the water. Surface water sources, like lakes and rivers, are vulnerable to contamination, whereas groundwater sources are typically less vulnerable due to their location in deep underground aquifers.*" *https://www.cru.ie/wp-content/uploads/2016/11/CRU18034-Irish-Water-Performance-Assessment-Report-No.-2-February-2018.pdf*

[xxxiv] https://www.epa.ie/pubs/advice/drinkingwater/drinkingwateraudits2019/Leixlip%20Water%20Treatment%20Plant%20Audit%2008.11.19.pdf (see part 2.5)

[xxxv] As the EPA reported in its *"Drinking Water Quality in Public Supplies 2018"* report, barriers might be in place in treatment plants but they are not always properly operated/maintained, resulting in failures*: "The EPA is particularly concerned that the public continues to be put at risk by inadequate treatment resulting in Cryptosporidium being present in water supplies… It is not enough to have a barrier in place, it must also be properly operated and maintained".* *https://www.epa.ie/pubs/reports/water/drinking/EPA%20DW%20Public%20Supplies_web.pdf*

[xxxvi] EPA "Drinking Water Audit Reports" following the 2019 Leixlip boil-water-notices: *"the River Liffey is in the highest risk category for a surface water source (S3 lowland catchment, high concentration of cattle, sheep, horses or humans in immediate vicinity or upstream, or waste water treatment outfall upstream)" and, as such, needs a "5-log" treatment process in order to be made safe for public consumption:* *https://www.epa.ie/pubs/advice/drinkingwater/drinkingwateraudits2019/Leixlip%20Water%20Treatment%20Plant%20Audit%2008.11.19.pdf* *https://www.epa.ie/pubs/advice/drinkingwater/drinkingwateraudits2019/Leixlip%20Water%20Treatment%20Plant%20Audit%2024.10.19.pdf*

the sea, where it "*is more likely to contain material from agriculture, industry and towns and villages*"[xxxvii].

Water from well-protected deep-water wells, on the other hand, is among the most secure water available. It needs far fewer treatment processes than river water and the risks to the public in the event of a failure at the water treatment plant are significantly lower. A key finding of the EPA's most recent report on the quality of water in Ireland[xxxviii] (which is more recent than the 2016 report cited in the dNWRP) was that the quality of river water in Ireland is low (only 53% is now deemed "*satisfactory*") and is declining at an alarming rate. By contrast, groundwater (from wells) is the highest quality water in Ireland (98% of Ireland's groundwater is currently categorised as "*good*") – and this is actually improving, not declining.

This issue is important and should have been highlighted in the dNWRP. Irish Water should be cautious about developing new river water sources, particularly if the water at that point is categorised as S3. Irish Water should be *very* cautious about extracting from close to the mouth of a river, where water is at its most vulnerable.

Many capital cities were originally built on major rivers and relied on that river for their entire water supply. This was the case in London (built on the Thames) and Paris (built on the Seine). However, as years passed and awareness grew of the risks of river water, both of those cities diversified. Paris now gets around 50% of its water from groundwater (wells) and its water supplier is clear that this diversification is the key to its security of supply[xxxix]. London now gets around 35% of its water from groundwater (wells) and recently built a back-up desalination plant for use in emergencies only (desalination plants are comparatively cheap to build – the London plant cost a total of just £250million – but comparatively expensive to operate, so this solution provided London with an emergency back-up water supply plus diversification protection without high up-front costs).

The dNWRP notes that Ireland gets 83% of its water from surface water sources. It fails to point out that this is considerably higher than any other country in the EU (and more than double the European average of 37%). France relies on rivers for just 34% of its supply, the UK 64%, Italy 39% and Germany 15%.[xl] The dNWRP also fails to point out that a national figure for this measure is not the most relevant one: each water resource zone (WRZ) can rely only on water sources within its zone. As such, WRZ-specific figures are far more relevant than national figures for this measure. This is where Ireland's real vulnerability is exposed: Dublin gets 99% of its water from surface water

---

[xxxvii] https://www.oireachtas.ie/en/debates/debate/joint_committee_on_housing_planning_and_local_government/2019-11-05/3/?highlight%5B0%5D=water&highlight%5B1%5D=services&highlight%5B2%5D=2017&highlight%5B3%5D=water

[xxxviii] "Water Quality in Ireland 2013-2018" (published in 2019) https://www.epa.ie/pubs/reports/water/waterqua/Water%20Quality%20in%20Ireland%202013-2018%20(web).pdf

[xxxix] Paris' water supplier states: "*The key strength of the water supply is the diversity of its sources. Equal amounts of water come from underground and river sources. This mixed supply enables efficient management of unexpected incidents like accidental pollution or pipe damage and [the water supplier] can mobilize different water resources alternatively depending on the situation".* *http://www.eaudeparis.fr/uploads/tx_edpevents/Brochure_institutionnelle_ENG_2013.pdf*

[xl] "*Trihalomethanes in Drinking Water and Bladder Cancer Burden in the European Union*" (15 January 2020) https://ehp.niehs.nih.gov/doi/pdf/10.1289/EHP4495

sources (rivers) and most (if not all) of that is S3 water. This is not prudent, not international best practice and leaves Dublin dangerously exposed.

The dNWRP should identify those WRZs that currently have high exposure to vulnerable river water and, when considering which new raw water sources to develop to address future water supply deficits in those WRZs, should give non-river water sources a significant priority over river-water sources due to the importance of diversification protection. This is particularly relevant for the GDA, which is by far the largest WRZ in the country and currently gets 99% of its water from surface water sources.

Dublin's vulnerability due to its 99% reliance on rivers should be flagged as a key risk to be addressed in the dNWRP. At the moment it is not mentioned in the dNWRP at all, which is a major oversight.

The value of the diversification protection that would be offered by a non-surface water source should be given a significant amount of weight in the consideration of future new water sources for Dublin. It is important to note, in this regard, that the extraction point of the proposed Shannon-to-Dublin pipeline is close to the mouth of the River Shannon, and would be extracting S3 water – so the Shannon pipeline would offer Dublin no diversification protection but rather, would *increase* its exposure to S3 river water.

PART 2:
USE OF INAPPROPRIATE DATA AND METHODOLOGY

Several parts of the dNWRP propose the use of data and methodology that is inappropriate and not in line with international best practice.

(a) Headroom/Peaking/Outage

Headroom/peakage/outage safety buffers must be calculated in accordance with international best practice

Irish Water provides for three "safety buffers" in the dNWRP in the form of: headroom and peaking (provided for on the demand side) and outage (provided for on the supply side) ("H/P/O"). The safety buffers are cumulative: the SDB assumes that all three of the "worst-case-scenarios" (which the three safety buffers are designed to provide for) exist to their fullest extent, every day.

We are supportive of these safety buffers. We are supportive of them being extra conservative in the dNWRP, to provide for the poor state of the water supply system in Ireland, and we are supportive of them being cumulative. However, it is vital that the safety buffers are appropriate (and not excessive) and that they are applied in line with international best practice.

This is important because the addition of the safety buffers can be a significant reason for a WRZ having a projected water deficit in 2044. For example, for the Greater Dublin Area (the GDA):

(i) The projected 2044 water deficit for the "dry year critical peak" (DYCP) scenario is **194Mld**; the safety buffer in that scenario amounts to **180Mld**[xli] (the safety buffer is almost as large as the projected deficit).

(ii) The projected 2044 water deficit for the "winter critical period" (WCP) is **166Mld**; the safety buffer amounts to **231Mld**[xlii] (the safety buffer is significantly *larger than* the projected deficit).

The safety buffers could be the primary driver for a project being undertaken to develop a new water supply source. This means taxpayers' money being spent. It is vital that taxpayers' money is spent if it is necessary - but it is also vital that taxpayers' money is *not* spent if a project is *unnecessary* and is driven, in part, by a safety buffer that is calculated in a way that is not in line with international best practice.

Headroom/peakage/outage should be applied to "accounted for water" alone - but the dNWRP applies them to leakage as well

For years, Irish Water and other organisations involved in water supply in Ireland have made it explicitly clear: Headroom/Peaking/Outage should be applied only to "accounted for water": they

[xli] It is possible to calculate from the GDA SDB data table that (for the DYCP) headroom is 58Mld (due to its inflation by the "peaking" factor – see part (b) below) and peaking is 91Mld. We assess outage to be 31Mld (we cannot be 100% certain of this because the DO/outage/WAFU columns in the SDB are not populated - but through some reverse engineering this is the figure that we have calculated).

[xlii] It is possible to calculate from the GDA SDB data table that (for the WCP) headroom is 61Mld (due to inflation by the "peaking" factor) and peaking is 137Mld. We assess outage to be 33Mld (but, again, we cannot be 100% certain of this for the reasons above).

should *not* be applied to (i) leakage, or (ii) any strategic industrial allowance (SIA). Countless statements have been made to this effect by Irish Water and others over the years[xliii].
Irish Water stated explicitly, at the time of its 2015/2016 Reports produced for the Shannon pipeline project, that this method for the calculation of the safety buffers (i.e. their application to "accounted for water" only, and *not* to leakage/any SIA) was in line with international best practice[xliv].

However, the dNWRP does the opposite:

- it provides for headroom and peaking on the *demand* side and applies them to average demand (which *includes* leakage and any SIA provided for in the non-domestic demand analysis);
- it provides for outage on the *supply* side but it is applied to WAFU (which is the equivalent of average demand i.e. it includes leakage/any SIA).

As a result, the safety buffers in the dNWRP are significantly larger than they would have been if the usual methodology (which Irish Water has confirmed is international best practice) had been applied.

[xliii] Here are some examples of what has Irish Water reports have said in this regard:

- "*a **Peaking** Factor of 20% has been applied to the relevant elements of demand excluding leakage and excluding the Strategic Allowance for Major Water Using Industry*"
- "*Typical international figures for **headroom** allowances range from 5%-10% (and tend toward the higher side) of the accounted for water*"
- "*Typical international figures for **outage** allowance range from 5%-7.5% of AFW*"
- "*A **peaking** factor is applied to Accounted For Water to allow for seasonal variation in demand*"
- "'***Headroom***' *is the allowance applied to Accounted For Water to compensate for risk and uncertainty*"
- "'***Outage***' *is the allowance applied to Accounted For Water to allow for unavailability of the water source or treatment plant*"
- *"The **peaking** factor is applied only to the Accounted For Water (AFW) average day demand, it is not applied to UFW"*
- *"**Peaking** is not applied to leakage, or to strategic industrial water demand"*
- "***Peaking** factors are only applied to accounted for water and **is not applied to UFW***"
- "*The **headroom** requirements calculations are based on accounted for water, which is composed of domestic demand, non-domestic demand and customer side leakage and excludes distribution losses, any allowance for major industrial users and operational usage."*
- *"Distribution losses and operational usage are excluded from the **headroom** calculation as leakage in the system and operational usage are unlikely to vary regardless of the amount of water being supplied through the existing infrastructure, and thus they should not impact the required capacity margin in terms of Ml/d".*

A presentation given by RPS Group to Engineers Ireland as long ago as 1 January 2006 stated "*headroom applied to "accounted for water" demand only i.e. not UFW or Strategic Industrial Allowances*".

[xliv] Irish Water said: "*The methodology used by Irish Water [relating to allowed factors for peaking, headroom and operational outages] is in line with international best practice for water resource planning.*"
http://www.watersupplyproject.ie/wp-content/uploads/2017/04/170406WSP1_Response-to-Emma-Kennedy.pdf (see page 26)

It is entirely inappropriate for Irish Water to abandon the methodology used for the calculation of headroom/peaking/outage in the past (which Irish Water has explicitly stated is in line with international best practice) and adopt a *new* approach (which Irish Water has explicitly stated is *not* in line with international best practice).

It is difficult to comprehend why Irish Water would make such a move – although it is notable that the change would result in a significant inflation of the projected water deficit for the Greater Dublin Area (and, as such, would arguably make it easier to justify a large and expensive project such as the Shannon pipeline project).

(b) "Peaking" is applied to "total demand" which *includes* headroom

Part 4.6 states that the "peaking factor" is applied to "total demand" to calculate the DYCP and WCP weather scenarios. Part 4.5 states that "total demand" is made up of the various components of water use *including headroom.* The "peaking factor" is therefore applied to *headroom* which is *not* best practice and is unacceptable – it results in an inappropriate inflation of the "headroom" safety buffer (and a consequent inappropriate inflation of the projected water deficit for the GDA).

Again, due to the absence of a line-by-line breakdown of "demand" in the SDB data tables, it is challenging to cross-check this but, by doing a reasonable amount of calculations one can indeed deduce that:

(i) for the GDA, the 2044 "headroom allowance" is stated as 51Mld,

(ii) for the calculation of the DYCP weather scenario a peaking factor of 13% is applied to the NYAA (which is average demand *plus headroom*). As a result of this peaking factor, the headroom for the GDA is thus inflated from 51Mld to 58Mld (for the DYCP),

(iii) for the calculation of the WCP weather scenario a peaking factor of 20% is applied to the NYAA (which is average demand *plus headroom*). As a result of this peaking factor, the headroom for the GDA is thus inflated from 51Mld to 61Mld (for the WCP).

This clearly cannot be allowed to stand: the "safety buffers" certainly should *not* be applied to one another in this way – this is not best practice and it results in an inappropriate inflation of the projected water deficit for the Greater Dublin Area.

(c) Per Capita Consumption

The dNWRP assumes that, over the next 25 years, per capita consumption (PCC) will be flat. The analysis for this in the dNWRP is limited and the conclusion is conceptually difficult to accept given the major focus (in both the UK and the EU) on the need for water suppliers to reduce PCC in the interests of sustainability and protection of the natural environment.

In the UK, OFWAT has set each water supplier a specific PCC reduction target for the next 5 years (for example, Thames Water must reduce PCC by 6.3%), and DEFRA has made this a key focus area. The EU is also keenly focused on the need for countries to reduce their PCC for sustainability reasons, and consumption reductions have been observed across Europe for many years. A recent study for the European Environment Agency found that "*in the last 10-20 years, water consumption has steadily decreased in most of the countries investigated in this study with the exception of Cyprus*"[xlv].

The assumption in the dNWRP that PCC will *not* be reduced at all over the next 25 years also fails to reflect the virtual certainty that customer side leakage will be reduced in the coming years through the First Fix Free scheme, which is about to be significantly expanded. It must be remembered that customer side leakage (CSL) constitutes a major part of PCC in Ireland –this is *different* to the UK, where losses from customer supply pipes are treated as part of "leakage" – this fact *must* be taken into account when using UK assumptions in relation to potential Irish PCC reduction.

Part 4 of the dNWRP does not reflect the latest status of the First Fix Free scheme. The section states: "*The First Fix Free scheme was initially very successful, but uptake has reduced to relatively low levels since the domestic charges were abolished*. *The savings associated with the First Fix Free scheme to date are estimated to be 120Mld (gross leakage savings)…. For this iteration of the NWRP, the CSL element of domestic demand is considered to remain static, based on empirical data trends from the "First Fix" scheme to date*". This statement in part 4: (a) cites data that is over 2 years old (as at Q4 2019, the First Fix Free scheme had recovered 155Mld (not 120Mld) – the 120Mld figure appears to be based on a report from Q1 2018), and (b) fails to reflect the proposed expansion of the First Fix Free scheme which will almost certainly result in very significant reductions in CSL in the coming years.

The PCC assumptions in the dNWRP should be amended to reflect the points above. This failure to properly account for the proposed expansion of the FFS results, again, in an inappropriate inflation of the projected water deficit for the Greater Dublin Area.

[xlv] "*Pricing and non-pricing measures for managing water demand in Europe*" Service Contract No 3415/ B2015/ EEA.56130 for the European Environment Agency

(d) It is unclear whether average PCC or county-level PCC is used for the purposes of the domestic demand calculation

The language used in parts 4.2.2.2 (base year domestic demand) and 4.3.2.2 (domestic demand forecast) is confusing and inconsistent. Part 4.2.2.2 refers to per capita consumption (PCC) at a county level (for the purposes of table 4.4) but the final section of part 4.2.2.2 (which is highlighted as the main finding of that part) states: "*Across all WRZs the base year average PCC is 133 litres per person per day*." The implication of this is that the PCC that Irish Water proposes to use for the calculation of domestic demand for all WRZs is the *average* PCC of 133 l/p/d.

Part 4.3.2.2 states "*we have forecast there will be no change in PCC over the 25-year period of this plan*". It then implies (although it is not clear) that the *county-level* PCC will be used for the calculation of domestic demand – but the figures that are then presented (at table 4.7) for domestic demand do not add up if they are calculated on the basis of *county-level* PCC.

Due to the absence of a line-by-line breakdown of "demand" in the SDB data tables (see part 3 below) it is not possible to cross-check those calculations themselves to check which data Irish Water is actually using for the domestic demand data in the SDB calculation – is it using the national average PCC of 133 l/p/d (which would be inappropriate given that better, more granular, data is available) or the county-level PCC?

PART 3:
SDB DATA TABLES DO NOT PROVIDE A LINE-BY-LINE BREAKDOWN OF "DEMAND"

(a) The dNWRP contains the long-awaited update of the Shannon Pipeline proposal – but the SDB data table does not contain a breakdown of "demand" (which *was* included in previous versions and is necessary for transparency)

The dNWRP contains a supply/demand balance data table (an SDB data table) for the Greater Dublin Area. This is highly significant in the context of Irish Water's proposed "Eastern and Midlands Water Supply Project" (commonly known as the Shannon Pipeline project (SPP)). The SPP began two decades ago. Four key reports have been produced, each containing a supply/demand balance (SDB) data table for the GDA. The latest two reports (which we refer to here as the 2015/2016 Reports) were produced by Irish Water after it assumed control of the project.

Kennedy Analysis identified **data and methodology errors** in the SDB data tables in the 2015/2016 Reports. Kennedy Analysis flagged these errors to Irish Water. Irish Water stated, in response, that it had always intended to update the SDB and that an update would be published in Q4 2017. The update was not published in Q4 2017, nor was it published in 2018 or 2019. We have been chasing for the update for 3 years. It was finally published in December 2020 as part of this dNWRP.

It was our expectation that we would be able to compare the updated SDB for the GDA with the previous SDBs in the 2015/2016 Reports in order:

(i) to check whether the data and methodology errors that we identified in the past have been addressed, and

(ii) to verify that the data and methodology that the dNWRP *states* (in the body of the report) that it is adopting for its SDBs is, indeed, adopted in the SDB data tables themselves.

This is important because, in the 2015/2016 Reports, Irish Water stated (in the main body of the reports) that its SDB calculation had adopted a particular set of data for non-domestic demand but, when one double-checked the data that populated the SDB data tables themselves, it could be observed that the SDB calculation did *not* adopt the data that Irish Water claimed to have adopted and had, instead, adopted the other set of data (which Irish Water had explicitly claimed it had *not* adopted). This underlines the need for the SDB data tables to be fully populated with data for each line of the "demand" calculation, and to be fully transparent and available for consultation.

However, the lack of a line-by-line breakdown of "demand" in the SDB data table in the dNWRP means that comparisons with the 2015/2016 Reports are difficult to draw and it is impossible to verify whether the methodology that Irish Water claims, in the main report, to be applying to its SDB calculation is, in fact, the methodology applied.

(b) The SDB data tables should reflect the line-by-line calculation of the SDB as set out in the main report - but they do not

Parts 3 and 4 of the main report of the dNWRP set out in words the methodology that Irish Water proposes to use to calculate the supply/demand balance (SDB) for each of Ireland's 539 "water resource zones" (WRZs) in order to predict whether, in 2044, there will be a *surplus* or a *deficit* of treated water available for supply (and the size of such surplus/deficit).

Appendix L contains 539 Supply/Demand Balance data tables (one for each WRZ). The SDB process that is explained, in words, in the main report should be reflected, in numbers, in the SDB data tables at Appendix L. The SDB data tables should be broken down on a line-by-line basis (with a line to reflect each stage in the calculation), in the same order as in the main report. This is set out in the UK guidelines that Irish Water claims to be following, and it is also the approach that Irish Water took in its 2015/2016 Reports for the "demand" analysis. The SDB data table for the GDA in each of those earlier reports was only one page long – however it contained a clear, line-by-line breakdown of the calculation of "demand" (broken down into population/per capita consumption/domestic demand/non-domestic demand/leakage/peaking factor/headroom and outage factor). It was easily accessible and allowed for a cross-check of the methodology described in the main report.

The SDB data tables in Appendix L of the dNWRP, on the other hand, do *not* contain the required line-by-line breakdown of the various components of demand. "Average demand" is stated as a total figure in one column. This is not acceptable: the SDB data table should reflect part 4 (the "Demand" section of the dNWRP) and show precisely how "average demand" is calculated, with a line for each of the following (reflecting the manner and order in which part 4 states that "average demand" is calculated):

- population
- per capita consumption
- the above two lines generate the next line: domestic demand
- non-domestic demand
- operational use
- apparent losses
- leakage
- headroom
- the above lines generate the calculation of "total demand"
- peaking / climate change factor

The SDB data tables contain various graphics and other information that takes up a lot of the space on the page but is *much* less important than a line-by-line breakdown of demand. If Irish Water wishes to include that information it should do so but, as a bare minimum, in the interests of transparency and for public consultation, it *must* include a line-by-line breakdown of demand, in the same (or a similar) way as in the 2015/2016 Reports.

The final sentence of part 4 (demand) states: "*The Demand methodology described in this Chapter has been incorporated into our draft Framework Plan and the associated Supply Demand Balance Calculations for each water supply can be found at Appendix L*". This is precisely what *should* have happened – Appendix L *should* show the calculations that correspond to the methodology described in part 4 – but, as a matter of fact, it does not. Appendix L contains just one column showing the total figure for "average demand" – there is no breakdown at all to show the calculation of the different elements, which is opaque and does not allow for proper consultation.

As is often the case with Irish Water reports, what Irish Water *claims* to have done does not correspond with what it has *actually* done, once you dig into the detail. This must be rectified.

(c) Apparent mathematical errors in the main report cannot be cross-checked in the SDB

The absence of a line-by-line breakdown of "demand" in the SDB data tables makes it impossible to cross-check apparent mathematical errors identified in the main report.

Domestic demand:

For example, the main report states (at page 66) that "domestic demand" is calculated for each region by multiplying the predicted **population** by the predicted per capita consumption (**PCC**). This would, indeed, be a standard way of calculating domestic demand. Table 4.4 (in part 4 of the main report) sets out 2019 PCC for various cities (and part 4 explains that PCC is predicted to remain flat for the 2019-2044 period, so 2019 PCC will be the same as 2044 PCC). Table 4.5 sets out predicted 2044 populations for various cities. Table 4.7 then sets out the predicted 2044 "domestic demand". However, the maths does not add up.

The data for the cities of Cork, Galway and Limerick (extracted from tables 4.4, 4.5 and 4.7 of the dNWRP) is shown in columns 1,2 and 3 of our table below. It should be the case that the figure in column 3 is the product of the figures in columns 1 and 2 – but it is not.

Column 4 shows the figure that is actually produced by multiplying the figures in columns 1 and 2. This equates to the 2044 "domestic demand" for those cities, calculated using the method proscribed and the data provided in part 4 of the dNWRP. But these figures are *different* to the figures for "domestic demand" for these cities presented in table 4.7 of the dNWRP (and shown in column 3 of our table). This is difficult to comprehend.

The "domestic demand" presented by Irish Water in table 4.7 of the dNWRP for each of these cities is *higher* than it should be, based on the data and methodology that Irish Water presents in part 4. Did Irish Water change the data but forget to update the relevant tables of part 4? Did Irish Water simply make a mathematical error in its calculations? Something is clearly wrong but, in the absence of a SDB data table setting out the line-by-line calculation of "demand", it is impossible to cross check exactly *what* is wrong.

	1	2	**3**	**4**
	2044 PCC (as 2019 PCC, extracted from table 4.4)	2044 population (extracted from table 4.5)	**Domestic demand as presented in table 4.7**	**Product of columns 1 and 2**
Cork city	143 l/h/d	325,838	**60 Mld**	**47 Mld**
Galway city	147 l/h/d	123,662	**30 Mld**	**18 Mld**
Limerick city	125 l/h/d	158,886	**23 Mld**	**20 Mld**

The "deficit" calculation:

The calculation of the projected 2044 national deficit (set out in part 6) also appears to be wrong (or, if it is correct, then the data set out in the other tables in part 6 is wrong). This is the single most important calculation in the entire dNWRP. For this to be wrong is seriously alarming.

Tables 6.1 and 6.2 show the data for **supply** (WAFU) and **demand,** in 2019 (the baseline year) and in 2044, for each weather scenario (NYAA, DYAA, DYCP and WCP). Table 6.3 then summarises the national net **deficit** for each of these weather scenarios. This data is shown in our tables below (one for 2019 and one for 2044) in columns 1, 2 and 3.

The deficit should be calculated by deducting the **demand** figure from the **supply** figure for that scenario. But the figures in column 3 (extracted from in table 6.3 of the dNWRP) do not correlate with the data in columns 1 and 3 (extracted from tables 6.1 and 6.2). They show a **higher** projected deficit for each scenario than the calculation, based on the data in tables 6.1 and 6.3, actually produces (which is shown in column 4 of the tables below, in red).

	1	2	3	4
Weather scenario	Supply 2019	Demand 2019	**2019 deficit (as shown in table 6.3)**	**2019 deficit (calculated using the data in tables 6.1/ 6.2)**
NYAA	1,723	1,924	**-280**	**-201**
DYAA	1,708	1,960	**-327**	**-252**
DYCP	1,773	2,266	**-550**	**-493**
WCP	2,139	2,508	**-412**	**-369**

	1	2	3	4
Weather scenario	Supply 2044	Demand 2044	**2044 deficit (as shown in table 6.3)**	**2044 deficit (calculated using the data in tables 6.1/ 6.2)**
NYAA	1,725	2,091	**-417**	**-366**
DYAA	1,622	2,141	**-562**	**-519**
DYCP	1,762	2,476	**-742**	**-705**
WCP	2,173	2,724	**-591**	**-551**

To support our position above, please see page 163 of the dNWRP (the "summary" section) which states: "*At a national level we currently have a DYCP demand of **2,266Mld** with a corresponding supply available of **1,773Mld**. This gives a deficit of **493Mld***". As you can see, this figure for the 2019 DYCP deficit of 493Mld (as cited in the "summary" of the dNWRP) corresponds with *our* figure for the 2019 DYCP deficit in the top table above (based on the data in tables 6.1 and 6.2). It does *not* correspond with the 2019 DCYP deficit presented in table 6.3 of the dNWRP (which is 550Mld)

The "summary" section then goes on to provide an example of the many inconsistencies in the dNWRP. It states: "*by 2044 we forecast a demand of **2,308Mld** and a supply yield that falls to **1,762Mld** because of climate change. This will result in a deficit of **546Mld***." This 2044 projected deficit (presented in the "summary" section of the dNWRP – and arguably the single most important figure in the entire report) does *not* correspond with that presented by Irish Water in table 6.3 – but nor does it tally with *our* projected figure in the table above. The reason for this is that although the 2044 *supply* figure cited in this sentence corresponds with the 2044 supply figure cited in table 6.1 (i.e. 1,762Mld), we have no idea where the 2044 *demand* figure (**2,308Mld**) cited

in this sentence comes from – it does *not* tally with the data in table 6.2 and it does not line up with the 2044 DYCP deficit presented in table 6.3.

So: either this sentence (which is one of the most important sentences in the entire dNWRP) is wrong, or the data in part 6 is wrong, or both. And again, without a sufficiently detailed SDB data table showing a line-by-line breakdown of the calculations for Ireland as a whole, it is impossible to cross-check this in Appendix L to try to understand what is actually going on.

(d) 20-hour, 22-hour and 24-hour design capacity is not explained

We note the inclusion in the SDB data tables of reference to 20-hour, 22-hour and 24-hour design capacity. There is no explanation of this in part 3 (or indeed in any other part) of the dNWRP itself and it is not clear from the SDB tables themselves how this data is relevant to, or applied within, the SDB calculation.

The only references to any 20-hour/22-hour/24-hour design capacity in the dNWRP itself is in part 3.8 which states: "*although there is less raw water availability from water sources, during a DYCP we allow our WTPs to operate at peak output over **22 hours***" and then "*The WAFU is higher during the WCP. This type of event tends to be short in duration and in some cases we may be able to increase the operating period of our treatment plants to address demand increase*" (which we *assume* relates to the 24-hour capacity - but it is *not* explicit). There is no reference *anywhere* in the report itself to 20-hour capacity.

The relevance and application of this 20hr/22hr/24hr treatment capacity needs to be fully explained in the report itself, and its application (for the purposes of the calculation of the SDB) needs to be clear in the SDB data tables.

(e) The SDB data tables should be year-by-year for the first 5 years

The UK guidelines on the production of SDB data tables are clear that for the first 5 years (so, for the dNWRP, from 2020-2025) the SDB should have a column for **every year**, and that it should only jump to a column **every 5 years** from the 5th year onwards.

This is *not* reflected in the SDB tables in Appendix L (which present a column **every 5 years** for the entire duration). In order to comply with IBP and full transparency, this should be amended.

PART 4:
INCONSISTENCIES AND ERRORS IN THE DNWRP

One concerning aspect of the dNWRP is its inconsistency. Different parts of the report contradict each another. One part of the report cites data that is *different* to that cited in another part of the report. This suggests a lack of adequate communication between different departments within Irish Water and a lack of a general oversight of the dNWRP itself. Below are just a few examples.

(a) Leakage data

2019 leakage data is inconsistent:

The base year for the dNWRP is 2019. 2019 data is historic and should, as such, be a known quantity. Leakage is the single largest element of demand and, as such, is one of the most important elements of the SDB. However, the dNWRP cites *three* different levels for base year (2019) leakage (741Mld, 756Mld and 739Mld) and *not one of these* aligns with the actual level of 2019 leakage as reported by the CRU (712Mld).

The SELL "glidepath" calculated in Appendix H on the basis of estimated 2019 data is presented in the main report alongside *different* base-year data – this is mathematically invalid:

Page 71 of the main report states "*the SELL forecasts have been calculated using the latest available data from the LMS for 2019*". This it is not correct: the SELL Appendix (which calculates the SELL forecasts) explicitly acknowledged that it was working off an *estimate* for 2019 leakage (because actual 2019 leakage had not been finalised at the time that it was produced).

The 2019 leakage estimate turns out to have been significantly higher than the real 2019 leakage level, yet Irish Water *failed* to update the SELL once 2019 leakage had been reported: the SELL "glidepath" calculated in the SELL Appendix (based on the *estimated* 2019 leakage level) is the same SELL "glidepath" that is adopted in the main report (but presented alongside a *different* 2019 base level to the one on which its projections were based). This is concerning on many levels, and this mixing of inconsistent data is mathematically invalid.

(b) First Fix Free results

We noted above that part 4 cited old data in relation to the First Fix Free scheme. The team at Irish Water that drafted part 1, however, used recent data: Part 1.5.2 states: "*We have achieved gross leakage savings of 154.2Mld on the private side*". This figure of 154.2Mld is *accurate and up to date*, as per the Q4 2019 First Fix Free results report (which was the latest report to be published ahead of the dNWRP).

Why does part 1 cite the latest data on this, while part 4 cites data that is well over 2 years old?

PART 5:
OTHER POINTS

(a) When will the "non-domestic demand" analysis for the GDA be published for consultation?

Part 4.3.2.3 states that the non-domestic demand forecast for the GDA was developed by independent economic analysts. It sets out (on a very high level) what that assessment considered yet, surprisingly, the analysis itself is not published as part of the dNWRP. We would have expected it to be attached as an appendix to the dNWRP (as was the case in the 2015/2016 Reports).

The previous non-domestic demand analysis for the GDA (published in the 2015/2016 Reports) was controversial and we flagged to Irish Water many concerns about it. It is vital therefore, in the interests of transparency and accountability, that this updated analysis is published and made available for public consultation.

When will this new non-domestic demand analysis be published for consultation?

(b) Has there been double-counting of "process losses"?

We note that, in its recent "recategorization" of the definition of "leakage", Irish Water states that water used at all Irish Water treatment plants (which used to be categorised as unaccounted for water or "leakage") is now being categorized within "non-domestic demand". The full details/numbers on this have not been published but it is our interpretation, based on what *has* been published, that this may include water wasted through the treatment process (i.e. "process losses"). Is this correct?

If so, (i.e. if "process losses" at WTPs *were* previously accounted for in UFW and *are* now accounted for in "non-domestic demand") then there is double-counting in the SDBs of the dNWRP because "process losses" are accounted for on both the supply side (in the "process losses" provision) and on the demand side (in "non-domestic demand"). This is mathematically unacceptable, results in an inappropriate inflation of the projected water deficit for the Greater Dublin Area, and must be addressed.

(c) The unconstrained options list has some glaring omissions

The "unconstrained options" list in table 8.3 sets out the options that Irish Water will consider for regions where it predicts there will be a water deficit in the future.

It should include the following options which are currently not included:

(i) a major mains replacement programme (see above),

(ii) in situations where treatment capacity at the water treatment plant(s) for a water resource zone is a constraining factor in the SDB calculation for that zone then the expansion of treatment capacity must be considered as a *stand-alone* solution (i.e. not just as a solution *in combination with* an increase in raw water extraction, which is the position currently stated in table 8.3). What is more, it must be the *top priority option* i.e. it should be considered as a priority over the development/expansion of new raw water supplies – it will almost always be more sustainable to expand existing treatment capacity than to expand/develop new raw water supply sources.

(d) Why is the base year assumption for CSL not published?

Customer side leakage (CSL) is treated as part of per capita consumption for the purposes of the dNWRP but it is clear from Part 4 that, as would be expected, Irish Water has made an assumption for the base-level (2019) level of CSL - however, for some reason it is not set out in the dNWRP.

The figure reported for "base year" CSL was one element of "demand" that Kennedy Analysis identified had been incorrectly calculated by Irish Water in the 2015/2016 Reports for the Shannon pipeline project. The First Fix Free scheme results that have been published in the past two years have proven that Kennedy Analysis was indeed *correct* in its assertion that Irish Water had used *inaccurate* base-year data in its 2015/2016 Reports.

This is a controversial element of demand which Irish Water has calculated incorrectly in the past and, as such, Irish Water's latest assumptions of base year CSL for the dNWRP should be published for the purposes of transparency and consultation.

(e) Why does Irish Water not follow international best practice, as it claims to do?

The dNWRP repeatedly claims that it follows best practice methodology – yet, once you dig into the detail, it does not.

Here are some examples of where the dNWRP does not follow best practice (for details, see above):

1. The 5-year leakage target should reflect the target recently agreed with the CRU in the RC3 process: it does not.
2. The dNWRP uses "SELL" for its 25-year leakage target and claims to do so because this is the approach adopted in the UK – but SELL is no longer considered best practice in the UK.
3. The list of potential solutions (in table 8.3) should include *all* possible options – yet it omits two of the most important solutions: (i) mains replacement, and (ii) an increase in treatment capacity as a stand-alone solution.
4. Dublin gets 99% of its water from rivers which is not best practice - yet it is not flagged as a key risk in the dNWRP.
5. Different sections of the dNWRP are inconsistent and contradictory - for example, the reporting of base year (2019) leakage and the reporting of the First Fix Free scheme results.
6. The SDB data tables do not provide a line-by-line breakdown of the elements of "demand".
7. The SDB data tables do not provide a year-by-year breakdown for the first 5 years.
8. The dNWRP reveals apparent mathematical errors in some of the key calculations (e.g. domestic demand and the "deficit" calculation).
9. The headroom/peaking/outage safety buffers are calculated in a manner that Irish Water itself has stated in the past is not international best practice.
10. The dNWRP combines different sets of data that are not consistent with one another – for example, in its presentation of the SELL "glidepath".
11. No reduction is projected for per capita consumption over the coming 25 years (despite this being a major focus-area in the EU and despite anticipated reductions in customer side leakage through the newly-expanded First Fix Free scheme).
12. "Peaking" is applied to "headroom".

CONCLUSION

Ireland needs a major mains replacement programme – yet this is not even considered as one of the options in the dNWRP.

The Greater Dublin Area desperately needs diversification away from river water – yet this is not even flagged as an issue to be addressed in the dNWRP.

This draft plan sounds good on a high-level read:

(i) it claims to adopt "ambitious" leakage targets,

(ii) it purports to be built around the slogans "use less, lose less, supply smarter",

(iii) it claims to use "international best practice" and latest data,

but none of the above translate into reality once you read the report in detail.

This report contains many errors which result in an *over-statement* of the predicted water deficit for the Greater Dublin Area (the GDA). This is significant given the backdrop: **this plan sets the stage for the advancement of Irish Water's proposed Shannon-to-Dublin water pipeline.** If the use of inappropriate data/methodology results in the prediction of an overstated water deficit for the GDA then the Shannon pipeline may be considered a feasible solution on the basis of a *false premise*. This would risk taxpayers' money being spent on an *unnecessary* project that would not even address Dublin's main problems: its unreliable pipes and lack of diversification.

Irish Water has a history of dismissing the issues that Kennedy Analysis has raised during public consultations regarding its proposed Shannon-to-Dublin pipeline project. The issues that we flag in this submission must not be ignored: the stakes are too high.

APPENDIX 1

Observations regarding Appendix H of the dNWRP (the "SELL Appendix")

In light of the feedback we give above regarding the dNWRP's proposed use of SELL (i.e. the fact that SELL is no longer considered best practice in the UK and has been heavily criticised by the UK water regulator, OFWAT) we trust that SELL will no longer be incorporated into the SDB analysis in the dNWRP.

If, however, Irish Water did contemplate continuing with its proposed use of SELL for the setting of leakage targets then we have the following observations about the SELL Appendix of the dNWRP (Appendix H).

Inadequate and inconsistent data

The one point that comes up again and again in the SELL Appendix is this: Ireland simply does not have a long enough history of good, reliable water data to use SELL as a methodology. The issue of inadequate data is stated countless times in the SELL Appendix and it has some serious consequences (see below).

The unreliability and inconsistency of Irish Water's data can be observed in section 8.2 of the SELL Appendix ("Repair costs") which sets out the assumed costs of leakage repairs. It flags the fact that the repair costs data provided by Irish Water to the consultants who prepared the SELL Appendix appeared to be inaccurate. It states: "*updated unit costs for repairs provided in December 2019 by Irish Water were… **EUR 8,012** for find and fix repairs across all LAs…. We note that the find and fix repair costs are considerably higher than would be expected. Previous analysis for the SELL in 2015 and 2016 was provided with data demonstrating repair costs of **EUR2,000 to EUR3,000**."*

The magnitude of this inconsistency within Irish Water's data is alarming to say the least.

The SELL is ultimately calculated using a generic UK formula and generic UK data

Calculation of "background leakage":

"Background leakage" is, according to the SELL Appendix itself, "*one of, if not the single most important input in to the SELL, and the parameter to which it is most sensitive*". The calculation of background leakage is covered in section 7 of the SELL Appendix.

Section 7 states that there are 2 ways to estimate background leakage:

1. Using a generic formula, and
2. Using company specific data.

It explains that there are two generic formulae that are used in the UK for the calculations of background leakage, one of which is the UKWIR Managing Leakage 2011 formula which incorporates **generic UK data** for assumed rates of background leakage for different parts of the water supply system (distribution mains/communication pipes etc) for 3 scenarios (low, average and high) - for example, for *distribution mains*, the assumed flow rate of background leakage is 20 l/km/hr (low), 40 l/km/h (average) and 60 l/km/h (high). Nowhere in section 7 does it generate an estimate of "background leakage" using either of the 2 generic UK formulae - however, reference *is*

made to a "*sensitivity analysis section for the GDA*" (no reference is made to a sensitivity analysis for Ireland as a whole) which, it suggests, would be based on the generic UK formulae/data (instead of on company-specific data).

Section 7 states: "***the use of company specific data is always considered preferable to using generic formulae… Generic formulae are a useful cross-check*** *and benchmark where there is concern about data quality or a complete absence of data"*. It then makes reference to the new LMS (leakage management system) and states: "*there is some data in the system currently, but not a long time series".* It then has a long section explaining how it has used the (very limited) Irish Water data available to calculate an estimate of "background leakage" in Ireland. It concludes section 7 by stating: "*this approach has estimated background leakage to be 68.7 l/property/day* ***and this has been used in the SELL for this 2019 update***".

Calculation of overall SELL:

Section 9 of the SELL Appendix sets out the overall methodology used for the calculation of SELL. It cites two methods (methods A and B) and concluded that (due to Irish Water's limited data) the best method to adopt was method A, and that (within method A) there are three cost curve formulae that can be selected:

(i) a generic logarithmic curve,
(ii) a generic hyperbolic curve and
(iii) a company-specific Irish Water SELL model.

It says that (iii) (the Irish Water-specific model) is *"the preferred approach that has been taken forward*" and that (ii) (the generic hyperbolic curve) is "*used as a cross-check*".

Section 9.2 ("GDA") opens with: "*this section provides a summary of the approach, methodology and outputs for the GDA*". In section 9.2.1 it presents the GDA SELL using the generic *hyperbolic curve* which produces a SELL of **120Mld**. In section 9.2.2 it presents the GDA SELL using the *Irish Water-specific SELL model* which produces a SELL of **119Mld** which, it states, "*is considered reasonable when compared to the generic cost curve approach outlined in section 9.2.1*".

So at this stage, the SELL Appendix has repeatedly stated that the GDA SELL is **119Mld** (calculated using the Irish Water-specific SELL model) and that this has been cross-checked against a generic model (the hyperbolic curve model, set out at section 9.1) which supports the finding of 119Mld for the GDA SELL.

Section 10 is called "Sensitivity Analysis". Section 10.2 ("SELL sensitivity for the GDA") states: "*The short run SELL of 119Mld for the GDA is considered the best estimate of the SELL based on the data available in late 2019. However, there remains considerable data uncertainty at this time, particularly with respect to active leakage control efficiency and in relation to background leakage estimation. In light of the data uncertainties and* ***to test the sensitivity of the estimates****, we have also estimated SELL for the GDA using* ***UKWIR Managing Leakage 2011 estimates of distribution network background leakage****, and a less optimistic view of active leakage efficiency. The following scenario is therefore intended to present an* ***alternative*** *short-run SELL that can be* ***compared*** *to understand the sensitivity of the estimate to be used in the long-term water resources planning context."*

So this is saying that another **generic UK formula (which uses generic UK data)** is proposed to be incorporated into another cross-check of the GDA SELL (which was produced using the Irish Water-specific model/Irish Water best available data). It is worth noting, of course, that the GDA SELL was already cross-checked (using the generic hyperbolic curve approach) in section 9.2 and that the conclusion still held that the GDA SELL of 119Mld (calculated using the Irish Water-specific SELL model) should stand. Section 10.2 went on to calculate a GDA SELL using this UKWIR Managing Leakage 2011 model to calculate the background leakage (i.e. a *generic UK model which applied generic UK leakage rate data* – this model used *no* Irish data at all for the calculation of background leakage). This approach resulted in what it describes as an "alternative" GDA SELL of **135Mld** (considerably higher than the 119Mld found by the Irish Water-specific model).

Section 10.2 concluded with some confusing statements, saying that the SELL of 119Mld for the GDA "*is considered the best current estimate using available data*…" but then going on to say "*it is recognised that the SELL is one of the key inputs when making **strategic decisions** in relation to **long-term projects** for the supply demand balance. In the interests of making "no regrets" decisions at this time, given the uncertainties in relation to input data associated with the SELL, **taking a prudent view of SELL is advised***" – but at no point did it state that this "alternative" (and significantly *less ambitious*) SELL of 135Mld (that was calculated by using a generic UK formula and generic UK data) should or would be used instead of the GDA SELL of 119Mld (that was calculated using the Irish Water-specific model and Irish Water data for background leakage).

A strange conclusion:

The opening paragraph of section 13 (Conclusions) states: "*the SELL for the GDA is 119Mld*" and that, after taking account of "economic pressure management", the SELL for the GDA is **114Mld**.

However, section 13 (Conclusions) then goes on to say:
"*the SELL of 114Mld for the GDA is considered the best current estimate using available data from late 2019. However, there remains considerable data uncertainty at this time, particularly with respect to active leakage control efficiency, and in relation to background leakage estimation*" and, two paragraphs later, it re-states the wording from section 10.2 that stated "*it is recognised that the SELL is one of the key inputs when making **strategic decisions** in relation to **long-term projects for the supply demand balance**. In the interests of making "no regrets" decisions at this time, given the uncertainties in relation to input data associated with the SELL, **taking a prudent view of SELL is advised***".

It goes on to present a "summary table" containing various lines of figures. The figure at line 6 of that table is called the "Alternative short run sell" and is, in fact, the **UKWIR-generated SELL** (i.e. the method that used a generic UK formula and generic UK data). The figure at line 7 of that table (which is 130Mld for the GDA and is highlighted in green) is called "Alternative short run SELL plus pressure management in GDA" – so this is the **UKWIR-generated SELL plus pressure management**.

The final, concluding sentence of this entire 52-page Appendix sits just below that table. It is not highlighted and there is nothing to indicate that it is the single most important sentence of the entire Appendix, and that it effectively walks back various conclusions drawn and stated elsewhere in the Appendix. It simply states, with no further clarification at all: "*For the purposes of the*

National Water Resources Plan – Framework Plan, the Short Run SELL plus pressure management, highlighted in "Green" in table 13.1 has been used as the Target SELL values for the GDA and Nationally, for the draft Framework Plan". **The line highlighted in green in the table is line 7 – i.e. the UKWIR-generated SELL for the GDA (plus pressure management).** Let us remind you: the UKWIR-generated SELL used a **generic UK formula** and **generic UK data** for the calculation of background leakage.

<u>The SELL Appendix ultimately relied upon a SELL calculation that used a generic UK formula and generic UK data – this produced a considerably less ambitious long-term leakage target than was generated using the Irish Water-specific SELL model cited elsewhere in the Appendix</u>

The ramifications of this tucked-away sentence (which is not, you will note, grammatically correct – this is unusual for this Appendix which generally reads well) are hugely significant.

This SELL Appendix had stated *countless* times that the GDA SELL is **119Mld** (or 114Mld with pressure management), which is calculated using the Irish Water-specific model and Irish Water data. It stated this in the "Executive Summary" of the Appendix and in the opening paragraph of the "Conclusions" section of the Appendix. That figure was calculated by consultants using a complex Irish Water-specific SELL model and using the (limited) Irish Water data available. The background leakage element (one of the key elements) for the Irish Water-specific model was stress-tested against a generic hyperbolic curve model and the conclusion remained that the GDA SELL of 119Mld stood.

At no point *anywhere* does the SELL Appendix *explicitly* state that the UKWIR-generated SELL will be used for the purposes of the dNWRP. The Executive Summary (at page 4) does make reference to the UKWIR-generated SELL, but only in the following terms: "*In light of the data uncertainties and to test the sensitivity of the estimates, we have also estimated SELL using UKWIR Managing Leakage 2011 estimates of distribution network background leakage, and a less optimistic view of active leakage efficiency. We have also explored the impact of additional economic pressure management in the GDA. This results in a short-run SELL of 130MLD for the GDA"* – the Executive Summary does *not* state that the UKWIR SELL is being adopted: quite the contrary. It states *explicitly* (at page 4) that the GDA SELL is 119Mld/114Mld with pressure management (which are the SELL figures generated using the Irish Water-specific SELL model).

However, after noting that the level of SELL will have a significant impact on the size of the projected water deficit for the GDA (i.e. a *higher* SELL will result in a *larger* projected water deficit for the GDA), and after noting that "*strategic decisions*" and "*long-term projects*" will depend on the size of the GDA water deficit, this Appendix concluded with a tucked-away sentence that makes reference to a green line in a table. The effect of that sentence is that the GDA SELL for the purposes of the dNWRP is *not* 119Mld/114Mld (as repeatedly stated in this Appendix) but rather is 130Mld. **The effect of this will be a significant *increase* in the projected water deficit for the GDA.**

Adoption of the UKWIR-generated SELL contradicts the Executive Summary of the Appendix and the much-repeated statement that the GDA SELL is 119Mld. It means that (despite Irish Water having paid consultants to go through a highly complex process of calculating the GDA SELL using an Irish

Water-specific model and calculating background leakage for the GDA using Irish Water data) **a generic UK formula and generic UK data will be used** to calculate background leakage.

This supports our over-riding position on SELL: if the quality of Irish Water's data is so poor that its calculation of SELL has to resort to the use of a **generic UK model** using **generic UK data** then SELL is not the appropriate method to be using in Ireland at this stage.

If, in the future, Irish Water has good enough data to be able to generate SELL for its own purposes, using its own model and its own data then, at that point, it might be reconsidered – but for now, for its leakage reduction target in the dNWRP, Irish Water should follow the latest best practice in the UK and simply set leakage targets using an **absolute reduction target** – e.g. "*over the next X years Irish Water will reduce leakage by Y% which amounts to a reduction of leakage in absolute terms of ZMld"*.

This approach would be transparent, measurable and simple for all stakeholders (including members of the public) to understand. This is key for transparency and accountability.