Response to Referee Comment 1:

Thank you for your constructive comments and suggestions. We believe addressing these comments will strengthen the paper and improve the message and key points we are trying to convey. Below, we respond to the specific comments, point by point and provide clarifications where necessary. We are confident that through this process we can improve the structure and effectiveness of the paper and communicate the results more clearly. Importantly, we are not sure if the reviewer was made aware that this paper was submitted to a Special Issue on the region "Berlin/Brandenburg" with a very specific local focus. Considering the scope of the SI might help to clarify some of the comments made.

Sincerely,

Dr. Maria Magdalena Warter (on behalf of all co-authors)

This paper by Warter et al. deals with the resilience of streams facing droughts. This is a very interesting topic, as this resilience is due to complex processes that are dependent on interacting catchment characteristics (climate, geology, pedology, land use, water management practices,…). The study analyses hydrological and stable water isotopes data from a 5-year data set on 2 contrasted catchments in Germany (sizes, geologies, land uses,…).

The paper clearly has a lot of potential and deals with a large amount of data.

** Thank you for this positive evaluation of our manuscript.

However, I found it very long, wordy, and difficult to read, mainly because it lacks focus and precision in the analysis. Therefore, it is complicated for the reader to appreciate the results and the impact of the paper. My suggestion would be to rework the data to be able to present less «raw» and more to the point results. My main remarks and recommendations are listed below:

**We thank the reviewer for the careful review. We agree that the paper will greatly benefit from editing to remove text redundancies and "wordiness, to better highlight the value of the datasets and the additional understanding we gained from it.

With respect to "reworking" the data: we are not entirely sure what the reviewer means. Obviously, we cannot "reanalyze" the data BUT we revised the entire text to remove redundancies and partial "wordiness" in the manuscript. We are convinced this resulted in a more "to the point" presentation of the results. We also would argue that the chosen analyses make the best use of the unique long-term dataset of stable water isotopes. Other studies of catchment inter-comparisons use isotopic datasets like ours and similar analyses (i.e. storm events, young water fractions, transit times), to study catchment behavior and assess the differential impacts of urbanization and/or climate change on discharge and catchment dynamics (i.e. Bonneau et al., 2018, von Freyberg et al., 2018). However, the wealth of our isotope data set is quite unique (in terms of length and resolution). Therefore, we refrained from reworking any data, but rather improved the existing figures and text in such a way that they better present the insights gained from this study and highlight the uniqueness and usefulness of such long-term datasets.

1. Focus

It is not clear from the introduction on and in the whole paper what the focus and objectives of the study really are. The Objectives section of the Introduction (l82-104) is very long and wordy.

** We revised the introduction and removed any redundant information.

Do the authors deal with seasonal patterns of flow response?

** yes.

Response to rainfall events?

** yes.

Response to climate change?

** no.
Recovery from drought events?
** No
What is the temporal scale of interest?
** We worked with daily stable isotope data and hourly discharge/precipitation data to analyze streamflow and storm responses.

Similarly, the title of the paper indicates that the main focus of the paper lies in isotope tracer results, but there is also a very long «classical» hydrologic analysis that is not very well articulated with the isotope sections. This lack of clear focus is really a problem when we come to results interpretation and conclusions.
** Analysing stable isotopes in hydrology only fully makes sense when conducted within a "general" hydrological analysis. The main novelty of this manuscript stems from the use of isotopes, as it gives context to understanding the different catchment responses.
We condensed the mentioned paragraph (L 82-104) to give a clearer outline of this study and its objectives.

We articulated the focus of the paper more clearly in the objectives section (temporal scale, key focus area) and also presented clearer objectives.

That said, the focus of this paper was to firstly make use of the extensive datasets of daily stable water isotopes over multiple years and to study seasonal streamflow patterns of two (admittedly) contrasting catchments in the Berlin/Brandenburg region. This is addressing the scope of this SI, so the focus on drought was chosen to fit with the focus of the special issue, with the aim to understand the impact of hydroclimate forcing and anthropogenic water management on streamflow generation. So, in a sense we are contrasting the extremes of heavily managed urban and agricultural extremes to understand streamflow generation. Regarding temporal scale, our analysis was based on daily isotope and high-resolution discharge data over 5 years, but focusing on seasonal dynamics.

2. Selection of the catchments

As far as I can see, the catchments are very different in all aspects: climate (although this part is not very clear), sizes (the urban catchment is much larger), land use of course, but also geologies. The urban catchment is also heavily managed, with water inflow from a WTTP and flood regulation (+ other minor unclear details, see detail remarks below). Are these catchments really comparable? What is the point of comparing them since they are so different? In the paper they are not really compared, the results are shown and discussed sequentially each time. It makes it really hard to draw general conclusions from this juxtaposed study and limits the impact of the paper.
** We edited the text in a way that uses more comparative language and also avoids repetition. The catchments are both within 100km of each other and importantly, both are tributaries of the river Spree (with a catchment size of >10000 km2), which is a major water provider to the City of Berlin. Again, we would like to repeat that the focus of the Special issue where we submitted this paper to was on climate effects on water resources in the Berlin/Brandenburg region. Therefore, this study fits perfectly into the scope of this SI. We made this clearer in the introduction.

The catchments' regional climate / climate zone is therefore similar although they experience differences in their local climate. Otherwise, in terms of their size, land use, geologies and management they are very different. But we chose this specific comparison as the urban catchment – while larger, did resemble the rural catchment in land use prior to the advanced

urbanization. Our goal was to use these two contrasting catchments to understand baseflow responses following anthropogenic impact and extensive management, which is still somewhat underappreciated in hydrological studies.
We acknowledge that traditionally hydrological catchment comparisons tend to focus on catchments of similar size and characteristics, there has been plenty of previous international site comparison, sometimes spanning large environmental or climatic gradients, (i.e. Tetzlaff et al., 2009 a, b; von Freyberg, 2018) to assess differing catchment responses to climate forcing.
Therefore, we believe that there is major value in the comparison of these two catchments, as it is precisely the juxtaposition of heavily managed urbanized and rural near natural streams environments, that are of interest in times of declining streamflow permanence and extreme events (droughts and extreme rainfall).

3. Methods

For the hydrological analysis, many indicators are mentioned, again with a confusion between seasonal patterns and response to storm events. We do not know which indicators were actually calculated, and we lack a few basic informations about typical orders of magnitude on the catchment to appreciate theses choices (eg how many events were selected, average characteristics, typical discharge values and so on). A table summarizing all the indicators that were actually calculated and for which objective would be very welcome.
** We acknowledge that there are quite a few indicators and parameters presented. Table 1 was meant to provide the necessary hydrological context to the annual differences in streamflow behavior (Q5, Q95, minQ, maxQ, baseflow index and runoff) between the two catchments.
Most of these indicators (i.e baseflow index, runoff coefficient, Q5 etc) are standard hydrological parameters that are calculated from the available data. We explain how they were calculated in the relevant method section (Section 3.1 Climate and hydrological data, L167 – 175).
We provided an additional table summarizing the indicators and data its based on and included it in the supplementary material (Table S2) to avoid cluttering the main manuscript. This way, an interested reader can get the necessary information and background.

Regarding reference values and orders of magnitude, we provided additional values in Section 2 of the study catchment description.

For the selection of rain events, this is described in the method section (L176 – 186). We made the text clearer on which parameters are calculated and which are measured.

Is flow intermittence a topic of interest in the study? If yes, specific indicators could be looked at, plenty can be found in the literature. Same for «elasticity (l442). If the «recovery» from droughts is the main topic of interest (as stated in the paper's title), specific indicators can be also calculated (definition of drought events etc). I am not a specialist at all of isotope data, so I was not able to review specifically this section, but I would have appreciated a little more pedagogic explanations (perhaps with a schema explaining the various indicators calculated).
** The Berlin/Brandenburg region increasingly experiences stream intermittence. Our research group has published on this before, and we added relevant reference in the introduction (L86) citing the following papers - Luo et al., 2024; Ying et al., 2024; Kleine et al., 2021.

Although we acknowledge the issues of intermittency in this paper, the regulation of the urban stream by waste water means that it is not directly an issue there, which is why we have not provided the metrics mentioned.

Also, recovery of drought is not the main focus. As stated above, the analysis revolves more around a general understanding of streamflow generation and response under temporally variable hydroclimate forcing, which included a drought period. Focusing only on drought responses would require a different kind of analysis and indeed different indicators and definition of drought periods/events etc. which is beyond the scope of this study (but was addressed in other studies by the group).

We realize the complexity of isotope data for the less experienced reader and appreciate the suggestion of additional explanations. However, we would like to point out that in the relevant method sections (3.2 and 3.3) we already provided extensive information regarding data collection and calculation of the different parameters (i.e. Local Meteoric Water line, lc-excess, water ages, transit times). We believe this information gives enough context and information for reproducibility and understanding. We respectfully disagree to provide an additional “schema” as this would not add any value to the interpretation or presentation of results. However, we edited the text in this section to be more focused for easy understanding.

4. Results

The Results section is very descriptive. The hydrology sections are lengthy stories of what happened in each catchment year after year, where a more synthetic analysis would have been expected. The Figures don’t help. Figs 2-6 are extremely complex and contain way too much superimposed information, which is not necessary. For example in Fig 2, instead of presenting a full 5 year long hydrograph at 15 min time step that is completely illegible, it would have been much more interesting to present interannual flow regimes to study the seasonal patterns, and more focussed events for specific analyses. The authors also don’t choose between comparing the different years and comparing the catchments. As a result, it is impossible to obtain a clear picture of what is going on.

** We changed the colors in Fig. 1 for better readability and amended the Figure caption. We used hourly normalized specific discharge for better comparison instead of 15 min streamflow. We believe that showing the full 5 year hydrograph in relation to precipitation is important to provide a visual context of the different streamflow regimes and responses to climate forcing.

We added double mass curves to Figure 3 (former Figure 4) to show cumulative precipitation and discharge.

We restructured the results section in such a way that we start with a general description of precipitation patterns and rain events. We merged section 4.1 and 4.4 and reduced the text to present the most relevant results regarding the differences in the seasonal distribution of rainfall and dry periods, and the different storm events.

This is followed by Section 4.2 – a description of the seasonal streamflow patterns.

Then Section 4.3 presents streamflow isotope patterns. Finally, Section 4.4. presents results regarding young water fractions and mean transit times.

We would argue that the isotope figures (Fig. 4 (former Fig. 3), 5, 6) show an acceptable level of complexity similar to figures in other studies doing the same kind of analyses (i.e. papers cited in introduction, method and discussion sections) and have left the figures as is.

Some of the results in the text are also not supported by Figures, eg the section on storm events refers to the general hydrograph on Fig2 where nothing can be seen, and numerous correlations are mentioned in the text without supporting Figs or Tables.

**We merged the section on storm events (was Section 4.4), and made sure that any correlations were referenced to the relevant Figures/Tables.

I was not able to review the Isotope sections but the corresponding Figures seem also very complicated and unclear to me (eg in Fig 3: I really don't see the differences between the catchments. For both there are points all over the place. More explanations are needed).
**We acknowledge that the symbols may be hard to distinguish in their current form. We increased the size of the points to make them more visible. However, the representation of isotope results in dual isotope space as shown in Figure 4, (former Fig. 3) is a standard practice and meant to illustrate the variability and range of values found in each catchment.

We condensed the text to be clearer and more concise (L411-422)

As a general interpretation: the closer the values are together, the less variable they are -meaning a more constant and similar water source is present in a stream, while points spread larger apart indicate greater variability in the source water contributions and seasonal variability.

5. Discussion

The discussion does not bring much in terms of interpretation of results, maybe because the results are so scattered. It is therefore a mix of descriptive talk and more general considerations that are not directly linked to the paper's subject (example blue / green water concepts) or partially repeat what was already said in the Introduction.
**We acknowledge the wordiness and "descriptive talk" and reduced some text in the discussion.

However, we believe that our analyses do allow us to make a general link from the importance of understanding streamflow generation to blue/green infrastructure, especially in the urban environment, and we made this clearer in the revised manuscript. We argue that first understanding streamflow dynamics in a catchment and understanding the ability of a catchment to store/release water is important to evaluate the effectiveness of such measures, especially in highly urbanized systems. We clarified the novelty of such analyses – in particular for urban catchments. At the same time, this is also relevant in rural agricultural catchments where water bodies are increasingly important for maintaining blue-green fluxes and biodiversity.
Especially since streamflow generation and intermittency are becoming an increasingly important issue under advancing climate change (not just in the Berlin/Brandenburg region), we also believe it is relevant to highlight the use of stable water isotopes as a valuable tool to develop a more integrated understanding of hydrological dynamics, especially in ungauged basins where hydrometric data is less readily available.

Nevertheless, we reworded some of the text in the discussion to be more precise and highlight the results and their implications, without repeating results already presented. .

The conceptual model in Fig 7 is a very good idea to sum up and present the conclusions of the study, but it lacks precision. Being too general, it fails to bring forward the results and show the knowledge added by the study. In its present state, it presents traditional hydrological processes, as can be found in any hydrology course and could have been guessed from the start.
** We revised the figure as follows: we added flux amounts in mm and % and water ages in days as well as lc-excess to link the figure more explicitly to the results. We also made land use a less prominent feature and focused more on the link to hydroclimate and the impact of urban water management on streamflow generation.

6. Detail remarks

l260: is the drinking water for Berlin city withdrawn from the catchment? This part is not clear.
** Yes, water abstractions occur in the catchment. However, more water is imported into the catchment from the Spree and Havel, as Berlin depends on bank filtration to supply water to the city. We added this in the study catchment description.

l119: «flat lowland landscape»: is the only indication that we get about the topography. Is it possible to have a little more information, especially for the readers who are not familiar with the area?
**Additional information regarding topography was provided in the study catchment description. (L136-138)

Fig 1: the rural catchment is 60 km² but on the map the gauging station + sampling point is not located at the outlet, the catchment that was actually studied is much smaller then?
**Yes, the entire catchment is 60km^2 but since we are using the gauging station further up in the catchment – indeed the studied catchment area is slightly reduced (42 km^2). We added this in the description of the study site to insure this information is conveyed correctly.

p13: in the paragraph on seasonal flow regimes, there is a mention of response to precipitation events which is off topic + «evidenced by runoff coefficients»: where are these runoff coefficients? There is no ref to Fig or Table.
**The runoff coefficients were presented in Table 1 (Q/P). Added reference in the text.

Fig 5: what are the grey lines?
**The grey lines in the plot have been removed.

Additional References:

Bonneau, Jeremie, et al. "The impact of urbanization on subsurface flow paths–A paired-catchment isotopic study." *Journal of Hydrology* 561 (2018): 413-426.

von Freyberg, J., Allen, S. T., Seeger, S., Weiler, M., & Kirchner, J. W. (2018). Sensitivity of young water fractions to hydro-climatic forcing and landscape properties across 22 Swiss catchments. *Hydrology and Earth System Sciences*, *22*(7), 3841-3861.

Kleine L, Tetzlaff D, Smith A, Goldhammer T, Soulsby C. (2021) Using isotopes to understand landscape-scale connectivity in a groundwater-dominated, lowland catchment under drought conditions. *Hydrological Processes.* http://dx.doi.org/10.1002/hyp.14197

Luo S, Tetzlaff D, Smith A, Soulsby C. (2024) Long-term drought effects on landscape water storage and resilience under contrasting landuses. *Journal of Hydrology*, https://doi.org/10.1016/j.jhydrol.2024.131339

Marx, C., Tetzlaff, D., Hinkelmann, R., & Soulsby, C. (2021). Isotope hydrology and water sources in a heavily urbanized stream.*Hydrological Processes*,*35*(10), e14377.

Tetzlaff D, Seibert J, Soulsby C. (2009) Inter-catchment comparison to assess the influence of topography and soils on catchment transit times in a geomorphic province; the Cairngorm Mountains, Scotland. *Hydrological Processes*, 23, 1874–1886.

Tetzlaff D, Seibert J, McGuire KJ, Laudon H, Burns DA, Dunn SM, Soulsby C. (2009) How does landscape structure influence catchment transit times across different geomorphic provinces? *Hydrological Processes* 23, 945–953

Ying Z, Tetzlaff D, Freymueller J, Comte JC, Goldhammer T, Schmidt A, Soulsby C (2024) Developing a conceptual model of groundwater – surface water interactions in a drought sensitive lowland catchment using multi-proxy data. *Journal of Hydrology*, https://doi.org/10.1016/j.jhydrol.2023.130550

Reply to Comments by Referee #2:

Dear Referee,

Thank you for giving us the opportunity to revise our manuscript. We appreciate the careful review and the comments and suggestions provided. We believe these comments have helped to strengthen the focus of this paper and improve the message and key points we are trying to convey. Below, we address the specific comments as they were made, point by point and provide clarifications where necessary. We are confident that through this process we can improve the structure and effectiveness of the paper and communicate the results more clearly.

Sincerely,

Dr. Maria Magdalena Warter (on behalf of all co-authors)

Reply to General Comment:

The authors of this manuscript carried out an inter-comparison study of two anthropogenically impacted catchments (rural vs. urban land use), by integrating a hydro-meteorological and an isotopic-based monitoring. Data used for the analysis cover about five hydrological years, and such high-resolution isotopic datasets are particularly rare, especially for urban catchments. These datasets were used to investigate how drought periods affect the hydrological functioning of the two catchments and to characterize runoff persistence and resilience during droughts and in response to storm events.

The topic of the manuscript falls within the scope of the journal, and this study could represent a valuable contribution. Overall, the paper is well structured and written, but I have some major concerns that should be addressed in the revision. First of all, based on the discussion, it seems that most of the differences in the hydrological functioning of the two catchments is related to the very different land use; however, the inter-comparison was not conducted on two catchments with just a different land use, because they also differ in area, geology and annual rainfall. Secondly, based on Figure 1, it looks like that the density of weather stations is very low considering the size of the two catchments, and therefore, I am wondering whether rainfall measurements (especially during storm events) are representative of the entire catchments. Finally, I think that at the beginning of the results there should be a section focusing only on the seasonal distribution of the rainfall, the characterization of the drought periods as well as on the storm events (something described later in Section 4.4).

** First, we would like to thank Referee 2 for their overall positive evaluation and also their critical feedback.

We noticed that we weren't clear in our original manuscript re that both catchments are tributaries of the river Spree, a major river for the water supply of the City of Berlin. Thus, they are located in the same regional climate zone though do show different local climates. We have now included this information in section 2.2.

The two presented catchments are quite different in their land use, size, and geology. However, as also mentioned in reply to Referee 1, there are similar studies that conducted such inter-comparisons on hydrological responses of catchments that differ in size, underlying geology and hydroclimate properties (i.e. Tetzlaff et al., 2009a, b; von Freyberg et al. 2018). Our goal was to do something similar by using these admittedly contrasting catchments to understand how two key endmembers (urban vs agricultural) of anthropogenically impacted catchments, which are climatically impacted in Berlin/Brandenburg region, which was the focus of the special issue that this manuscript was submitted to.

However, we would also like to note that while current land use in both catchments may be different now, the urban catchment had a similarly agriculturally dominated land use prior to the rapid expansion of urban areas. Therefore, we believe that comparing these two specific catchments allows us to also evaluate in a way the effects of urbanization and streamflow management on streamflow generation in times of drought and extreme events, compared to rural less managed streams.

Secondly, regarding weather stations, we primarily used open source long-term data, and their number is limited. The station in Berlin Buch (open data by the German Weather Service) has been used in previous studies by the group of the Panke catchment (see Marx et al., 2021, 2023) and is representative for the catchment. The distance between weather station and catchment outlet is <15km. Similarly, the weather station in Hasenfelde (Brandenburg) has been used in previous studies of the Demnitzer Millcreek catchment (see e.g. Kleine et al., 2020, 2021) and is considered to be representative of rainfall dynamics (distance < 10km) in the area. As the focus of the study is not detailed storm event analysis we would argue that the use of these stations for the scope of our study is acceptable.

We edited the results section to make this clearer. In line with similar suggestions from Referee 1, we started with the presentation of the seasonal distribution of rainfall and responses to storm events, but also highlighting the dry periods in between. We merged text from sections 4.1 and 4.3 and shortened it. This is now followed by a description of the streamflow patterns (Section 4.2) and isotope dynamics (Section 4.3) and finally the description of young water fractions and transit times (Section 4.4).

Specific comments:

Section 2: These two catchments have more differences than similarities, so I am not sure that many findings can be related mostly to the land use. Maybe the focus of the manuscript should be more on the analysis of inter-annual variability (and on droughts) than on the catchment inter-comparison.

** We were not clear enough in our original submission that both catchments are actually located in close proximity (ca. 100 km) and both tributaries of one major river system (the Spree). We appreciate the suggestion to focus more on a comparative analysis of inter-annual variability of streamflow generation and the expression of drought. We gave the drought more emphasis during the revision, in line with the topic of the SI (drought risks in Berlin/Brandenburg region).

Figure 1: There are very few weather stations in the two study areas; are the rainfall measurements representative of the real spatio-temporal variability of rainfall over the entire catchments? Did the authors check the measurements during storm events and compare them to weather radar data?

**Yes, as mentioned above the two weather stations can be considered representative of the two catchments and have been regularly used in previous studies in the same catchments (see Marx et al., 2021, 2022, Kleine et al., 2021, 2020). We are therefore confident that using the two weather stations sufficiently captures the spatio-temporal variability of rainfall over each respective catchment. We point out that we are not modeling at sub-daily time steps, where convectional differences would be more important and require a higher resolution of weather data.

Figure 4a: Despite the different land use, area and geologies, for WY2019 I was expecting to see the lowest discharges in both catchments (compared to the following years). Based on the flow duration curves, it is clear that the different climatic conditions in the two catchments may have led to a different runoff response.

**Rather than only different climatic conditions, this is also a result of increased contributions of effluent into the urban catchment during the drought, that causes the increased discharge in the urban stream. Furthermore, in the urban area of Berlin during WY 2018/19 there were still several large summer convective events (up to ~50mm) while in the rural area, no rainfall was recorded for several weeks between March – May and only limited rainfall in summer, resulting in a much more severe decrease in streamflow.

The effects of the drought only became fully visible in WY 2019/20 in the urban area – as seen by the lowest discharges in that year (compared to following years).

When plotting the double mass curves, the differences in cumulative amounts become even clearer between WY2019 and the following WY2020 (see below), with the effects of drought being visible in WY 2020 and also the imbalance between precipitation and evaporation in the rural catchment.

Section 4.3: Besides flow duration curves, I recommend adding double-mass curves (cumulative precipitation vs. cumulative specific discharge) for comparing the hydrological response of the two catchments during different years and at the seasonal scale (the focus could be on drought periods as well as on very wet months).
**We added double-mass curves to Figure 4.

Section 4.4: The characterization of the rainfall events should be anticipated in the results and merged to the first section of the results, in order to help understand the hydrographs and the flow duration curves.
**We restructured the section to present the seasonal distribution as well as characterization of rainfall events at the beginning of the result section (L 271- 321), followed then by the results of streamflow patterns and flow duration (L355-375).

Section 4.5: What is the sensitivity of young water fraction estimates on the sampling design for both rainfall (how many collectors were used?) and stream water? I wonder whether capturing the isotopic variability during flashy events in the urban catchment would have determined a different estimation. Furthermore, in this case, results on young water fractions and MTT may be due to a combination of factors, such as catchment area, geology and land use.
**For the collection of rainfall isotopes, generally only 1 collector is used. We did use two separate datasets of precipitation isotopes from Berlin Steglitz (for the urban catchment) and from the AWS in Hasenfelde (for the rural catchment).
Regarding sampling of stream water isotopes, we collected daily samples to insure continuity. This is a high resolution for stable isotopes in particular as sampled of longer periods (inter-annually). However, it is likely that sampling over the course of a rain event could give different estimates of young water contributions, which may be more damped when sampling just on daily basis, especially in the urban catchment where runoff responses can be relatively quick. From previous sampling, we know that there is minimal effect on young water estimates during flow peaks.
We agree, that estimates of young water fractions and MTT are likely due to a combination of factors related to land use and catchment area, and in the case of the urban catchment – the overwhelming influence of wastewater, which complicates the estimation of MTTs.

Table 2: Adjusted R2 are very low and RSE are very high for the urban catchment. Perhaps, these values should be considered carefully during the interpretation of the results.
**Yes, we agree these values need to be considered with care. They highlight the difficulties of these methods to estimate young water fractions in urban catchments with a strong influence of wastewater, as the isotopic variability is much more damped than in the rural stream,

resulting in higher RSE and lower R2. We included a caveat in the in the discussion section regarding interpretation.

Section 5.3 should be revised (please see the comment about the inter-comparison); based on this text and Figure 7, it seems that land use represents the main factor determining the different hydrological functioning of the two catchments during drought and wet periods.
**As mentioned also to Referee 1, we amended the schematic graphic in such a way that there is less focus on land use effects and more just on the aspects of different streamflow patterns under drought/wet periods in different anthropogenic environments. We also added amounts of young water estimates (in months) and flux amounts (in mm) to give a specific link to the results.

Figure S2: In late April of WY2020, there should be a rainfall event triggering the flash and marked discharge increase; however, there is only a rainfall pulse with a very low magnitude. Is this correct? Discharge in WY2020 seems to have a very different behaviour compared to the following years; is there a specific explanation?
**These distinct flashes in the urban streamflow regime are not necessarily associated with rainfall pulses but rather with streamflow management and opening of a weir upstream. This generally triggers such a marked streamflow response downstream, as is visible between late April and May 2020. This is usually done during drier periods – as was the case during the spring of 2020, to increase the flowrate and avoid the stream drying out. In this particular case the increased flow lasted for about 2,5 weeks before being reduced again (weir closed).

Technical corrections
Line 84: ‘as part of’ can be deleted.
**Deleted

Line 96: ‘selected’ instead of ‘select’.
**Corrected

Line 100: ‘in an integrated way’ can be deleted.
**Deleted

Line 216: ‘MTT’ instead of ‘MMT’.
**Corrected

Figure 2: For baseflow I see pink or purple lines, not red lines. Furthermore, I do not see the winter and summer events highlighted in red and green, respectively.
**Colors changed. Figure description amended.

Line 398: If the correlation is negative, r should be -0.49.
**Corrected

Line 434: ‘2018-19’ instead of ‘208-19’.
**Corrected

Line 499: ‘due to’ repeated twice.
**Corrected

Line 500: Unclear ‘lack of recharge. Hydromorphic conditions…’.
**Corrected

Additional References:

Bonneau, Jeremie, et al. "The impact of urbanization on subsurface flow paths–A paired-catchment isotopic study." *Journal of Hydrology* 561 (2018): 413-426.

von Freyberg, J., Allen, S. T., Seeger, S., Weiler, M., & Kirchner, J. W. (2018). Sensitivity of young water fractions to hydro-climatic forcing and landscape properties across 22 Swiss catchments.*Hydrology and Earth System Sciences*, *22*(7), 3841-3861.

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Kleine, L., Tetzlaff, D., Smith, A., Wang, H., & Soulsby, C. (2020). Using water stable isotopes to understand evaporation, moisture stress, and re-wetting in catchment forest and grassland soils of the summer drought of 2018. *Hydrology and Earth System Sciences*, *24*(7), 3737-3752.

Marx, C., Tetzlaff, D., Hinkelmann, R., & Soulsby, C. (2021). Isotope hydrology and water sources in a heavily urbanized stream.*Hydrological Processes*,*35*(10), e14377.

Marx, C., Tetzlaff, D., Hinkelmann, R., & Soulsby, C. (2023). Effects of 66 years of water management and hydroclimatic change on the urban hydrology and water quality of the Panke catchment, Berlin, Germany. *Science of the Total Environment*, *900*, 165764.

Tetzlaff D, Seibert J, Soulsby C. (2009) Inter-catchment comparison to assess the influence of topography and soils on catchment transit times in a geomorphic province; the Cairngorm Mountains, Scotland. *Hydrological Processes*, 23, 1874–1886.

Tetzlaff D, Seibert J, McGuire KJ, Laudon H, Burns DA, Dunn SM, Soulsby C. (2009) How does landscape structure influence catchment transit times across different geomorphic provinces? *Hydrological Processes* 23, 945–953