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SUPPORT ON THE IMPLEMENTATION OF THE URBAN WASTE WATER TREATMENT DIRECTIVE (91/271/EEC)

UWWTD SIIF PLATFORM: TRANSFORMATION SERVICES - ALGORITHMS USED TO CALCULATE COMPLIANCE

RAMBOLL

International Office for Water

SUPPORT ON THE IMPLEMENTATION OF THE URBAN WASTE WATER TREATMENT DIRECTIVE (91/271/EEC) UWWTD SIIF PLATFORM: TRANSFORMATION SERVICES - ALGORITHMS USED TO CALCULATE COMPLIANCE

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1. INTRODUCTION

This document is presenting the UWWTD SIIF transformation services, and more specifically the algorithms used to calculate compliance for the version released in February 2021.

It is based on the documentation ***"Transformation services under UWWTD: Calculating compliance, Algorithms used on the UWWTD SIIF toolbox, draft 21 of December 2016"*** developed by OIEau and UmweltBundesAmt Austria (Authors: M Benoît Fribourg-blanc, M Nicolas Dhuygelaere & M Chady NASSAR (OIEau) supported by Ms Katharina Lenz and Ms Edith Hödl-Kreuzbauer (UBA)) for the previous versions of the UWWTD SIIF national website, within *Specific contract n°07.0201/2014/SFRA/698614/ENV.C.2 implementing Framework Service Contract ENV.D.2/FRA/2012/0013: "Expanding the Urban Wastewater Structured Information and Implementation Framework (SIIF) via: Improvement of the SIIF IT toolbox and Extension of the Urban Waste Water Directive (UWWTD) SIIF approach to four new Member States."*

2. OVERALL FRAMEWORK

2.1 Introduction

In the previous contracts, the UWWTD SIIF platform included two pages to display information about compliance of stations and agglomerations, similarly to the EEA UWWTD viewer.
While the compliance for stations is not required by the Directive, the agglomerations and urban waste water treatment plants are linked together and it is necessary to calculate the situation for the stations first, to then calculate the agglomeration compliance. It is therefore relevant to show as well the status of each station and each agglomeration.
In order to clarify all the rules and implement the necessary calculation in the UWWTD SIIF platform, it was then deemed necessary to develop clear decision trees that present for non IT experts, how the compliance is calculated. These can then more easily be implemented by IT experts in a set of algorithms in a calculation tool, and this was done for the UWWTD SIIF platform in the previous iterations. In the current contract, the algorithms were again adjusted and completed following identification of some additional special cases.

2.2 Description of the steps and associated decision trees

Directive 91/271/EEC requires agglomerations to be connected most often via a sewer network (but sometimes also via trucks) to treatment plants which discharge the treated waste water via discharge points to receiving areas. The required treatment depends on the type of the receiving area (freshwater, estuary or coastal water) and on its sensitivity to eutrophication parameters, its use for Drinking water production or due to other Directives (sensitive areas) or because it is open marine water (less sensitive areas). The decision trees are organised as follows:

1. To be able to show the compliance of the urban waste water treatment stations, it is first necessary to calculate the treatment required considering the size of the agglomeration and the type of the receiving area. (see Algorithm n°1: Waste Water Treatment plant: treatment required step A and step B)
2. It is then necessary to look at the treatment in place to check if this matches to the required treatment calculated in previous step, and to see if the performance for all the parameters for which a treatment is required is declared to pass. It is only if the treatment in place is correct and the performance is correct, that the treatment plant can be considered compliant. (See Algorithm n°2: Waste Water Treatment plant: treatment compliance and performance compliance, Step A)

3. In the case a country was awarded a delay for implementing the Directive an exception exist for treatment plant not compliant: they are not considered for the rest of the calculation and classified as "pending deadline (PD)" (See Algorithm n°3: Waste Water Treatment plant: treatment compliance and performance compliance, step B)
4. It is then possible to calculate the compliance of the agglomeration to article 3 which covers the wastewater collection. (See Algorithm n°4: Article 3 compliance (agglomeration))
5. Due to the quality of data provided, it is necessary to exclude from the next steps of the calculation some of the agglomerations reported. (See Algorithm n°5: Article 4, 5, 6 compliance, exclusion of some cases (agglomeration))
6. To calculate the compliance of agglomeration to the 3 relevant articles, and, as many agglomerations have more than one treatment plant, a first step is needed, that is to calculate the compliance of each treatment plant to the requirements of these 3 articles. (See Algorithm n°6: Station compliance for Agglomeration Article 4, 5 and 6)
7. Once the compliance of each treatment plant is calculated, it is possible to calculate the compliance of the agglomeration by combining the compliance of the respective treatment plants the agglomeration is connected to for each article individually. This is done in a first step for article 4 only. (See Algorithm n°7: Compliance of agglomeration for Article 4)
8. Then for article 6 only. (See Algorithm n°8: Compliance of agglomeration for Article 6)
9. Then for article 5 only. (See Algorithm n°9: Compliance of agglomeration for Article 5)
10. To calculate the overall compliance, the compliance to each article calculated previously is used, with the general rule that one not compliant situation leads to overall not compliant agglomeration. (See Algorithm n°10: Hierarchical compliance: overall compliance (agglomeration))
11. To calculate the legal compliance for each article, it is necessary to consider the hierarchical compliance rule (See Algorithm n°11: Hierarchical compliance: Legal compliance of individual articles 4, 5 & 6 (agglomeration))

All the above calculations are then used to feed the compliance maps of the UWWTD SIIF platform, but also the compliance graphs and each individual treatment plant fiche and agglomeration fiche.

To facilitate the appropriation by non experts, we chose to show all compliant situations and when a situation is not compliant but the deadline is still pending, it is shown as "Not Relevant" which means not compliant but deadline not passed. However the result of the calculation is stored in the platform as "Pending Deadline" to facilitate checking by administrator of the system.

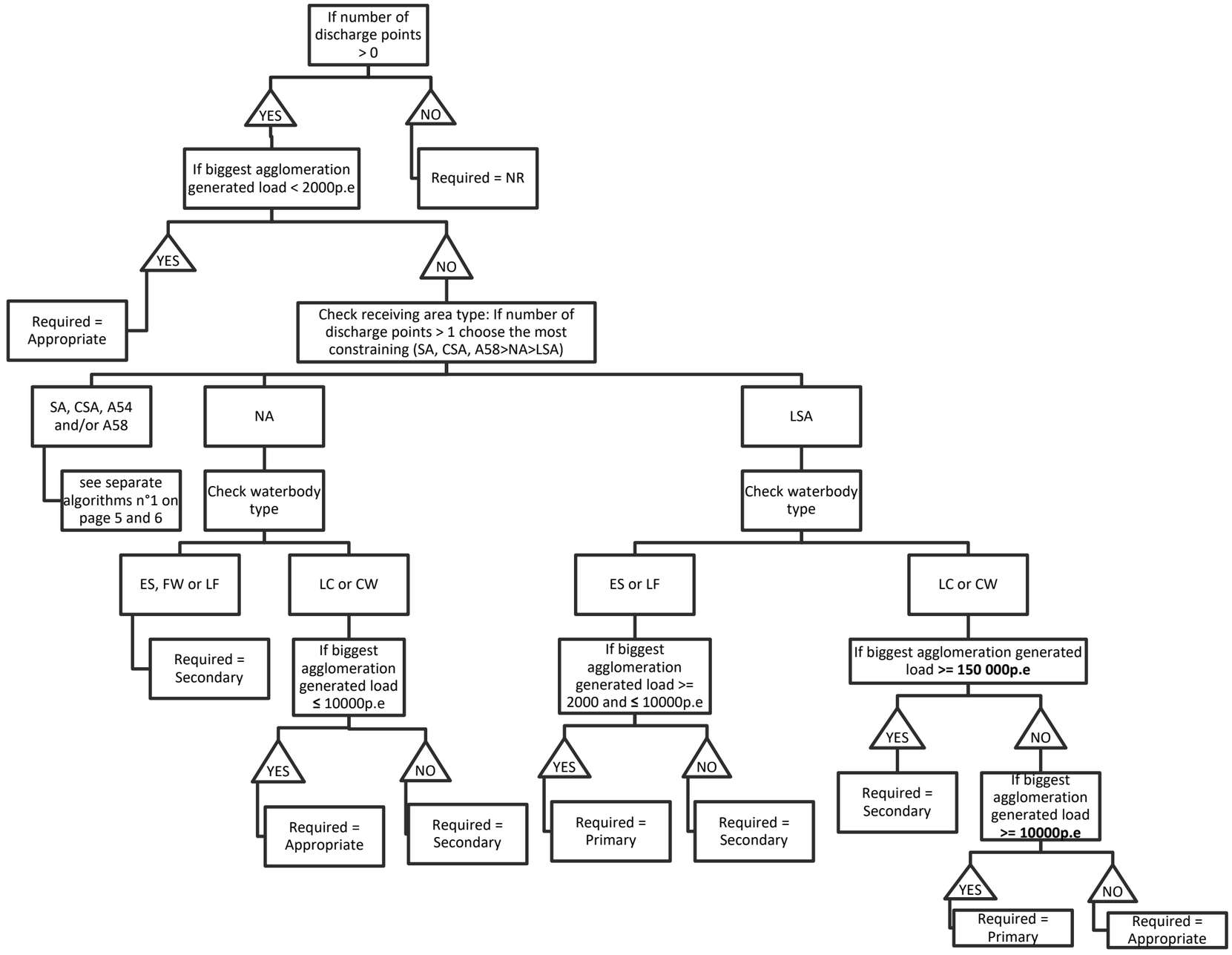
3. ANNEXES

Algorithm n°1: Waste Water Treatment plant: treatment required
Algorithm n°2: Waste Water Treatment plant: treatment compliance and performance compliance
Algorithm n°3: Waste Water Treatment plant: treatment compliance and performance compliance, correction for transitional period
Algorithm n°4: Article 3 compliance (agglomeration)
Algorithm n°5: Article 4, 5, 6 compliance exclusion of some cases (agglomeration)
Algorithm n°6: Station compliance for Agglomeration Article 4, 5 and 6
Algorithm n°7: Compliance of agglomeration for Article 4 only
Algorithm n°8: Compliance of agglomeration for Article 6 only
Algorithm n°9: Compliance of agglomeration for Article 5 only
Algorithm n°10: Hierarchical compliance: overall compliance (agglomeration)
Algorithm n°11: Hierarchical compliance: Legal compliance of individual articles 4, 5 & 6 (agglomeration)

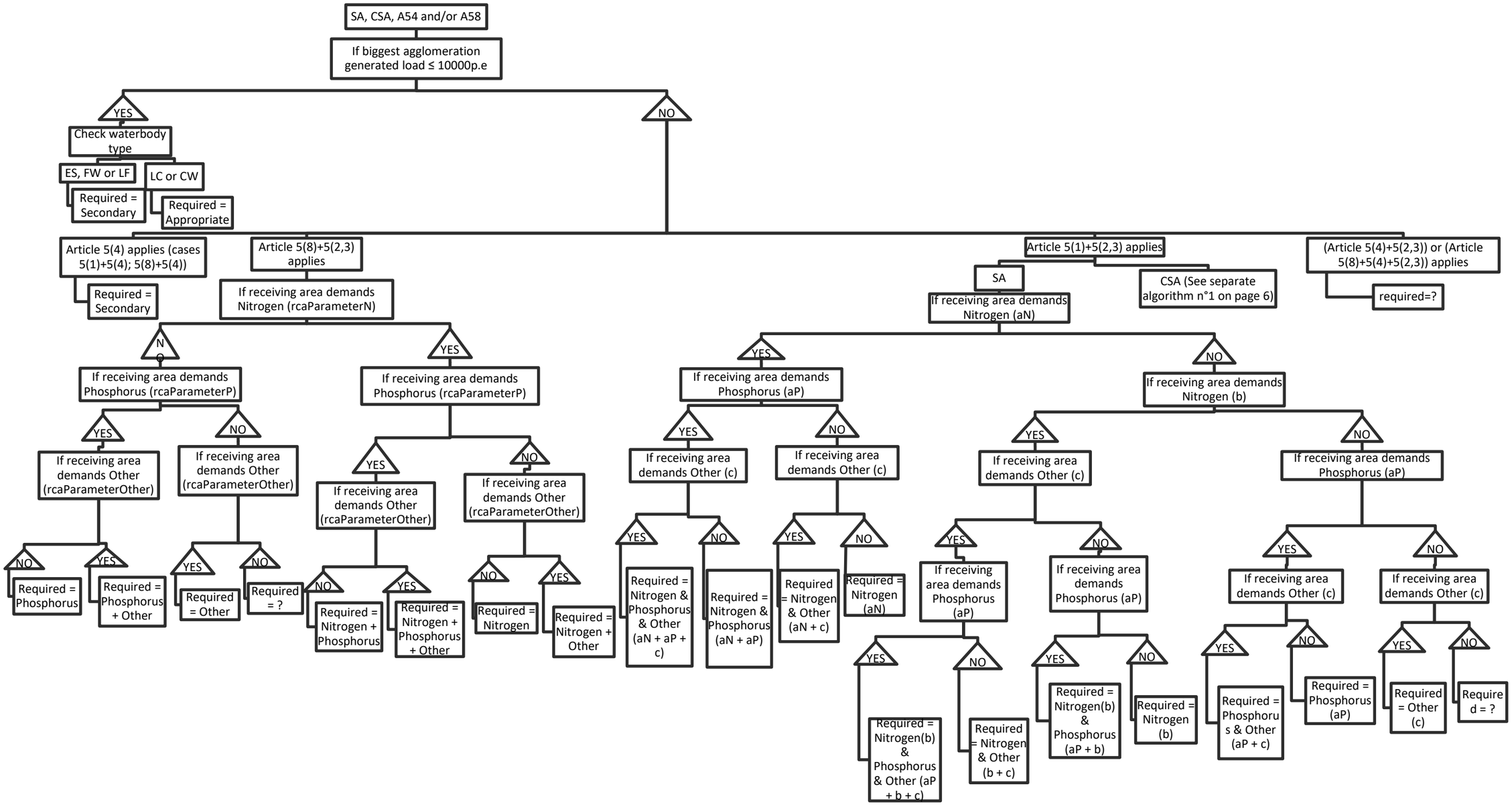
List of acronyms used in the following pages:

p.e.	Population equivalent
BOD5	Biological Oxygen Demand for 5 days
COD	Chemical Oxygen Demand
SA	Sensitive Area
CSA	Catchment of Sensitive Area
A54	Sensitive Area applying article 5(4)
A58	Sensitive Area applying article 5(8)
NA	Normal Area
LSA	Less Sensitive Area
ES	Estuary
FW	Freshwater
LC	on land (catchment of coastal water)
LF	on land (catchment of freshwater and / or estuary)
CW	Coastal Water
C	Compliant
NC	Not Compliant
PD	Pending Deadline *(considered Not Relevant - NR in the SIIF platform)*
NR	Not Relevant
QC	Questionable Compliance *(considered Compliant - C in the SIIF platform)*
AddQC	Additional Questionable Compliance *(only kept for information in database)*
C	Calculated
E	Estimated
M	Measured

3.1 Algorithm n°1: Waste Water Treatment plant: treatment required

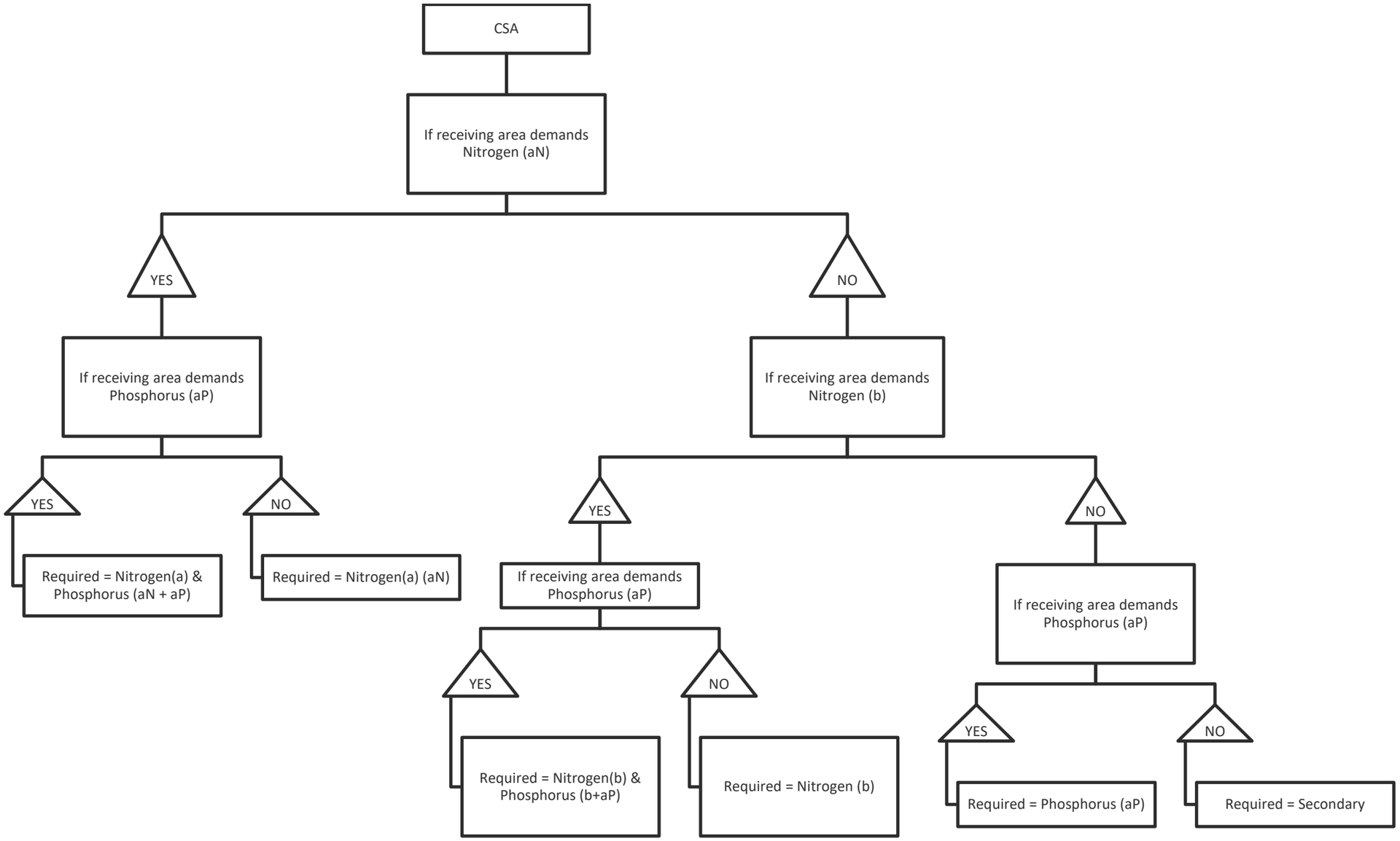


3.2 Algorithm n°1: Waste Water Treatment plant: treatment required (sensitive areas)



In bracket the name of the field in the data dictionary

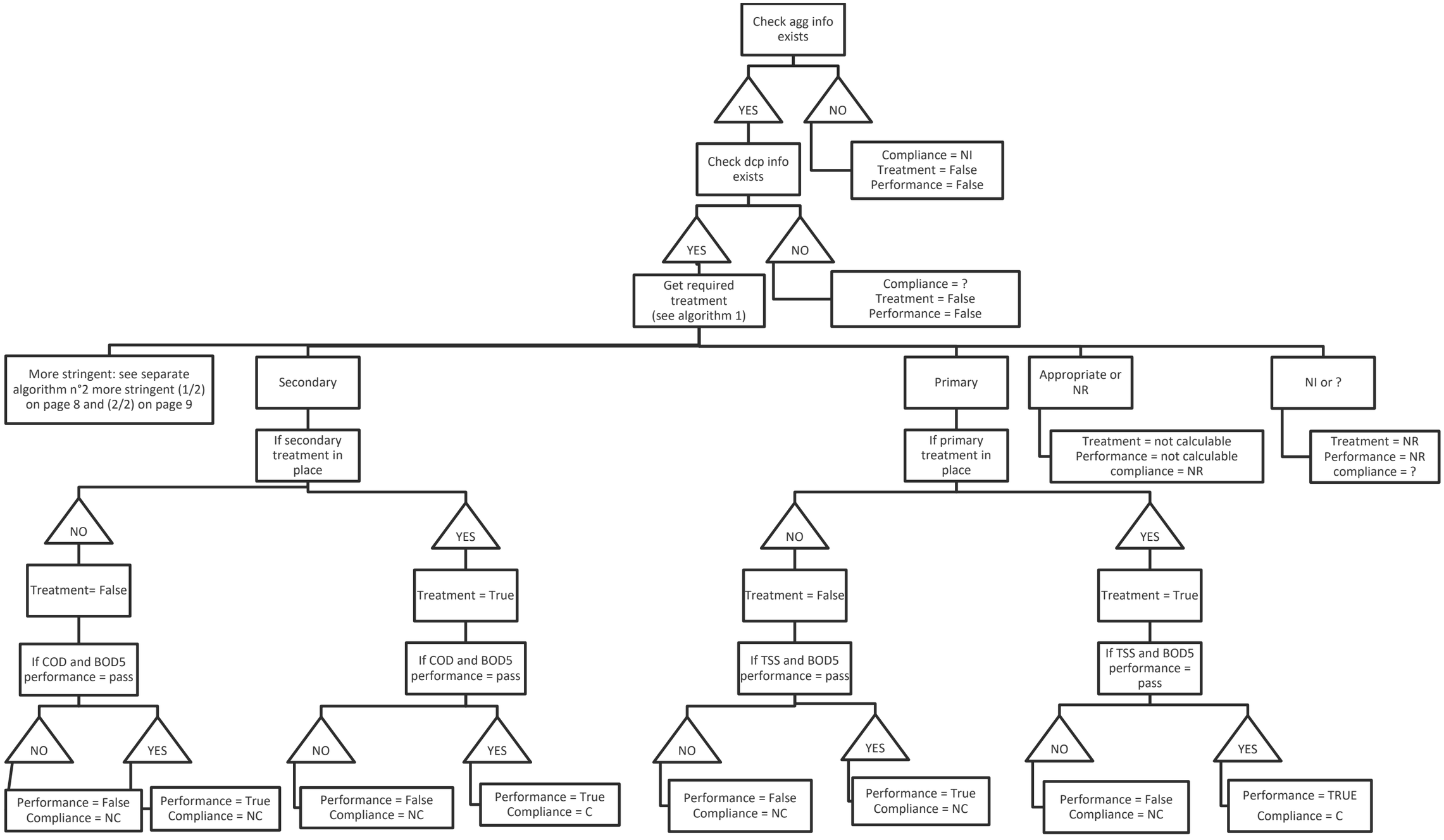
3.3 Algorithm n°1: Waste Water Treatment plant: treatment required (Catchment of sensitive areas)



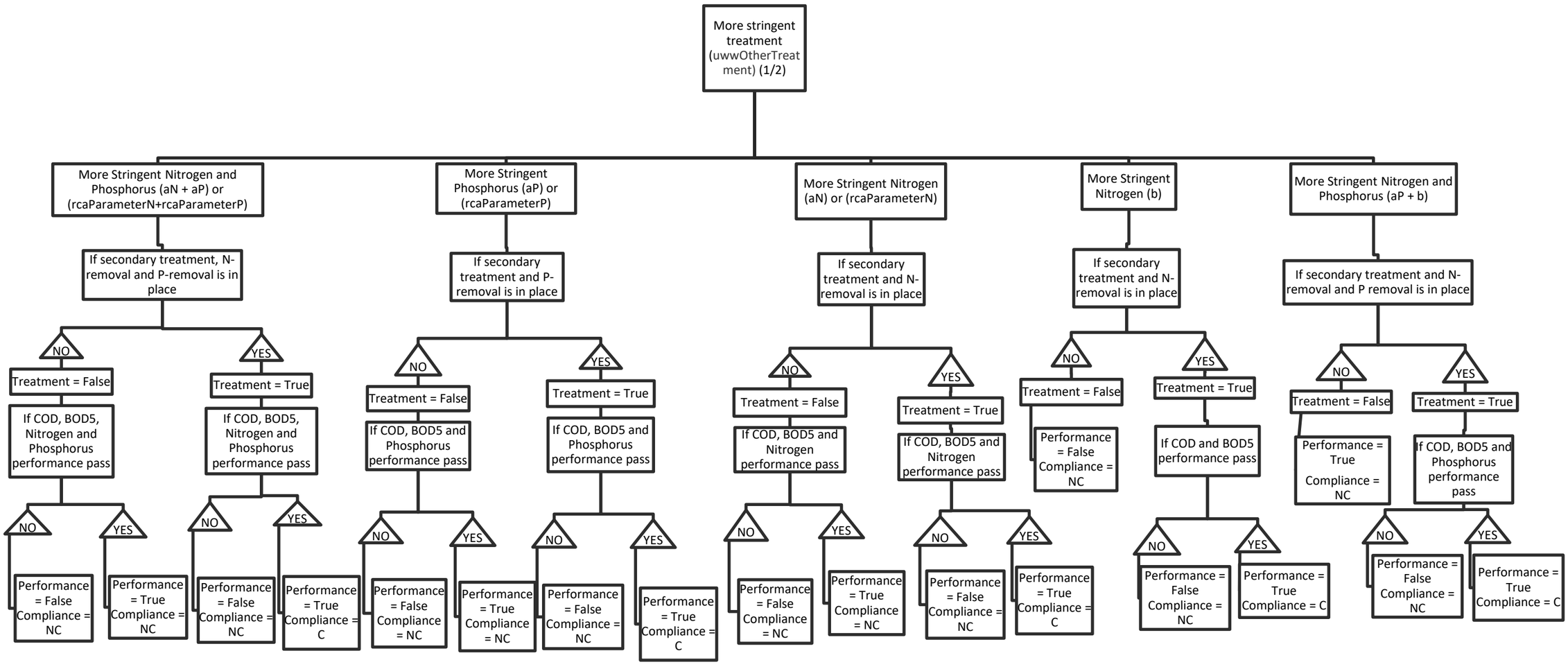
- Nota: The case where receiving area demands criterion c (other treatment) is not considered/listed here, because according to the document "UWWTD legal compliance assessment methodology document - Final version from 20 June 2014" (page 10) compliance with Article 5 under criterion c is only assessed for SA, but not for CSA.

Hence if CSA demands criterion c only, the required treatment is only secondary.

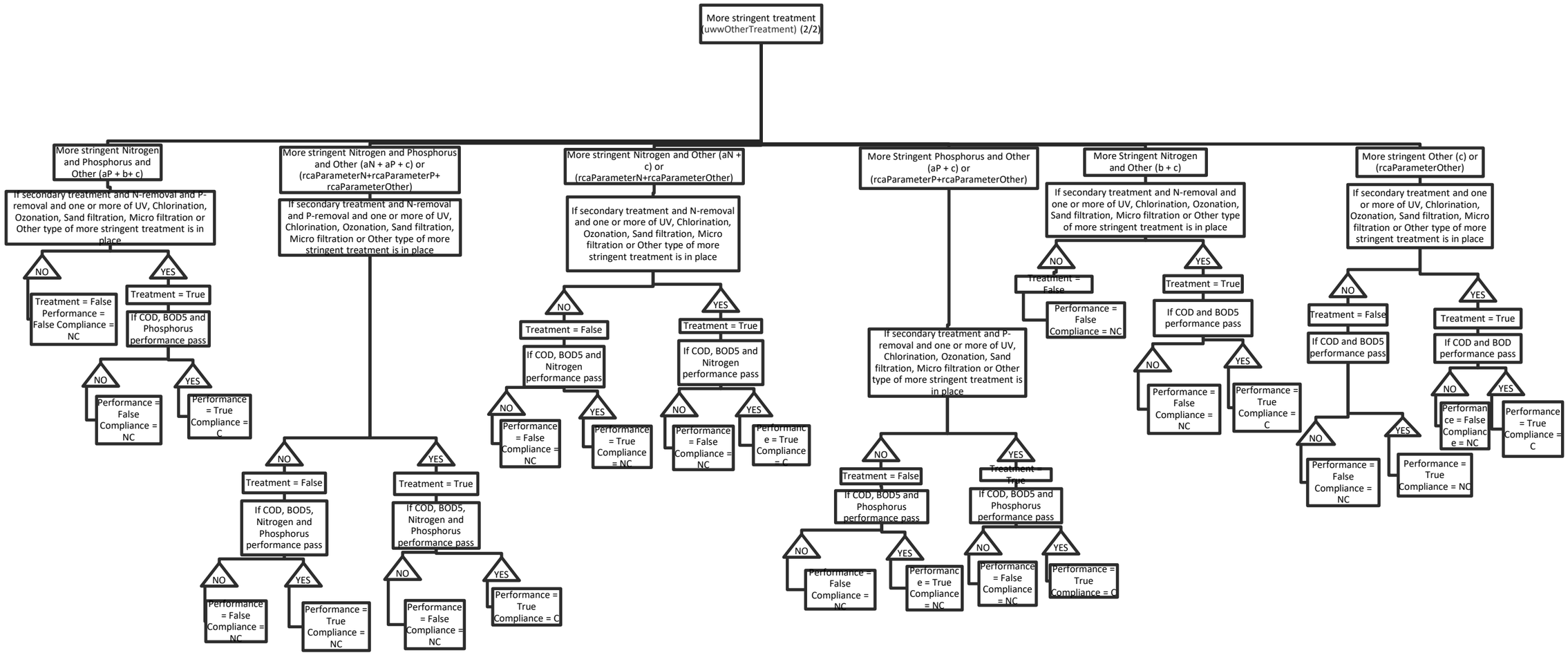
3.4 Algorithm n°2: Waste Water Treatment plant: treatment compliance and performance compliance (except more stringent treatment)



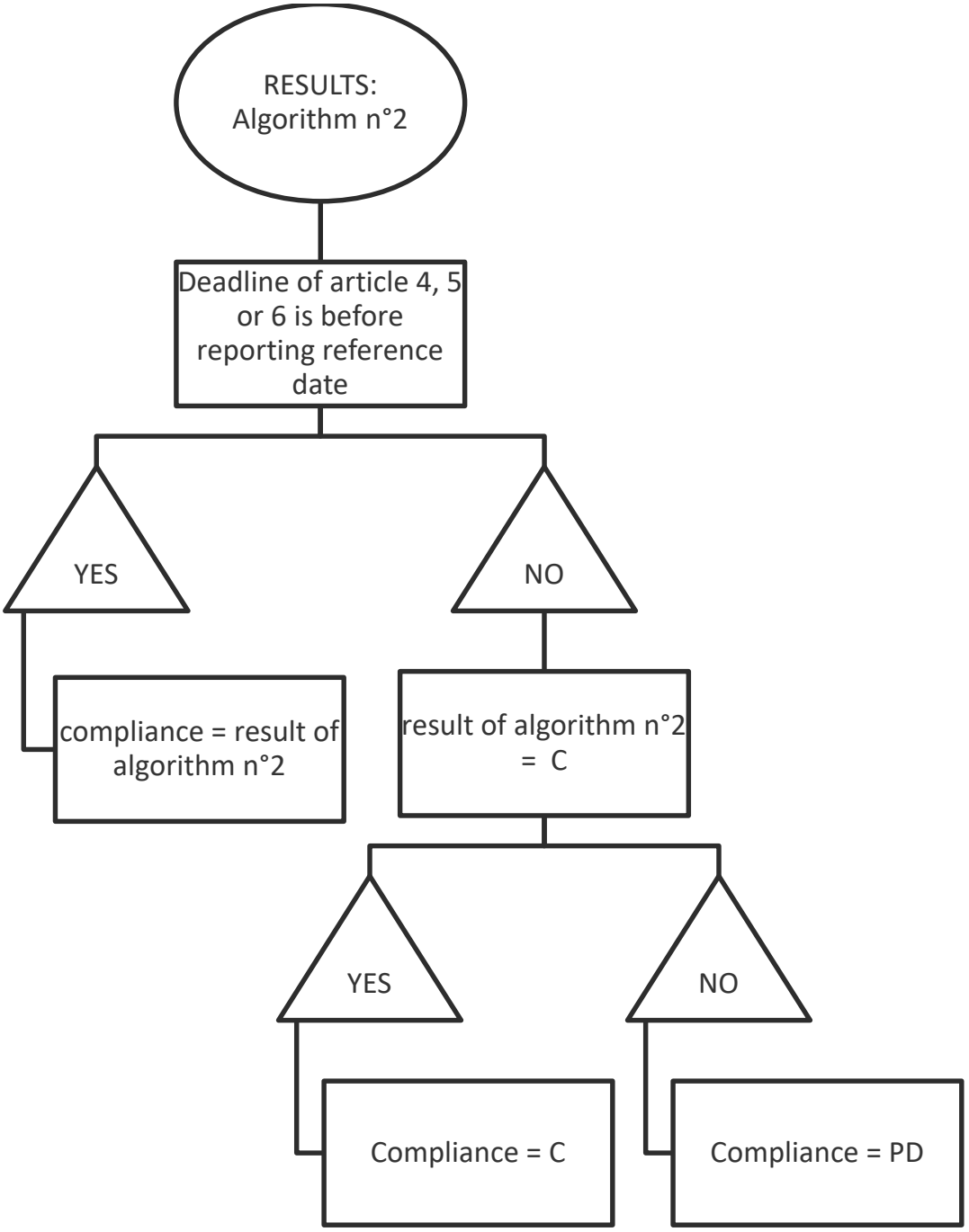
3.5 Algorithm n°2: Waste Water Treatment plant: treatment compliance and performance compliance (more stringent treatment 1/2)



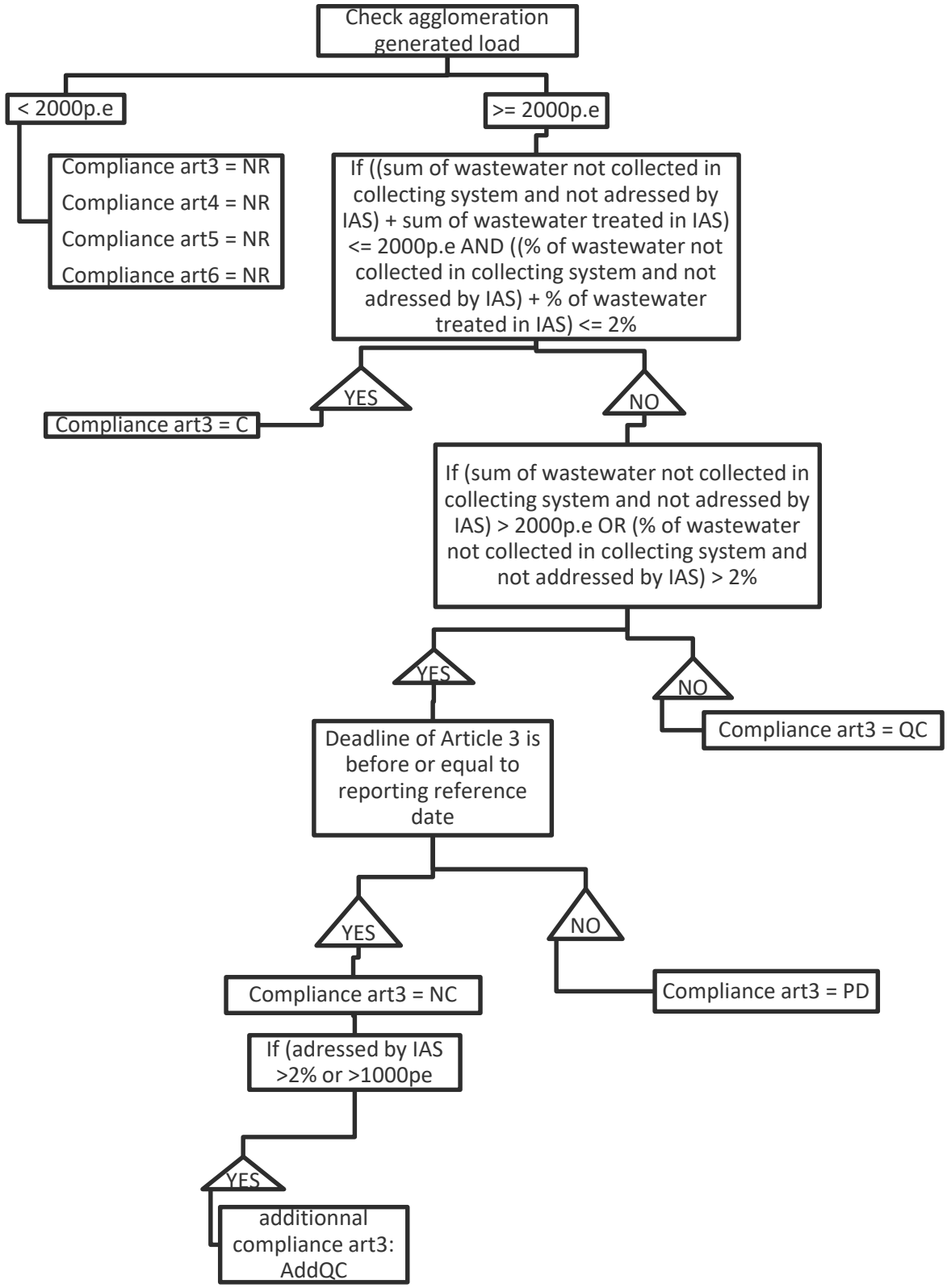
3.6 Algorithm n°2: Waste Water Treatment plant: treatment compliance and performance compliance (more stringent treatment 2/2)



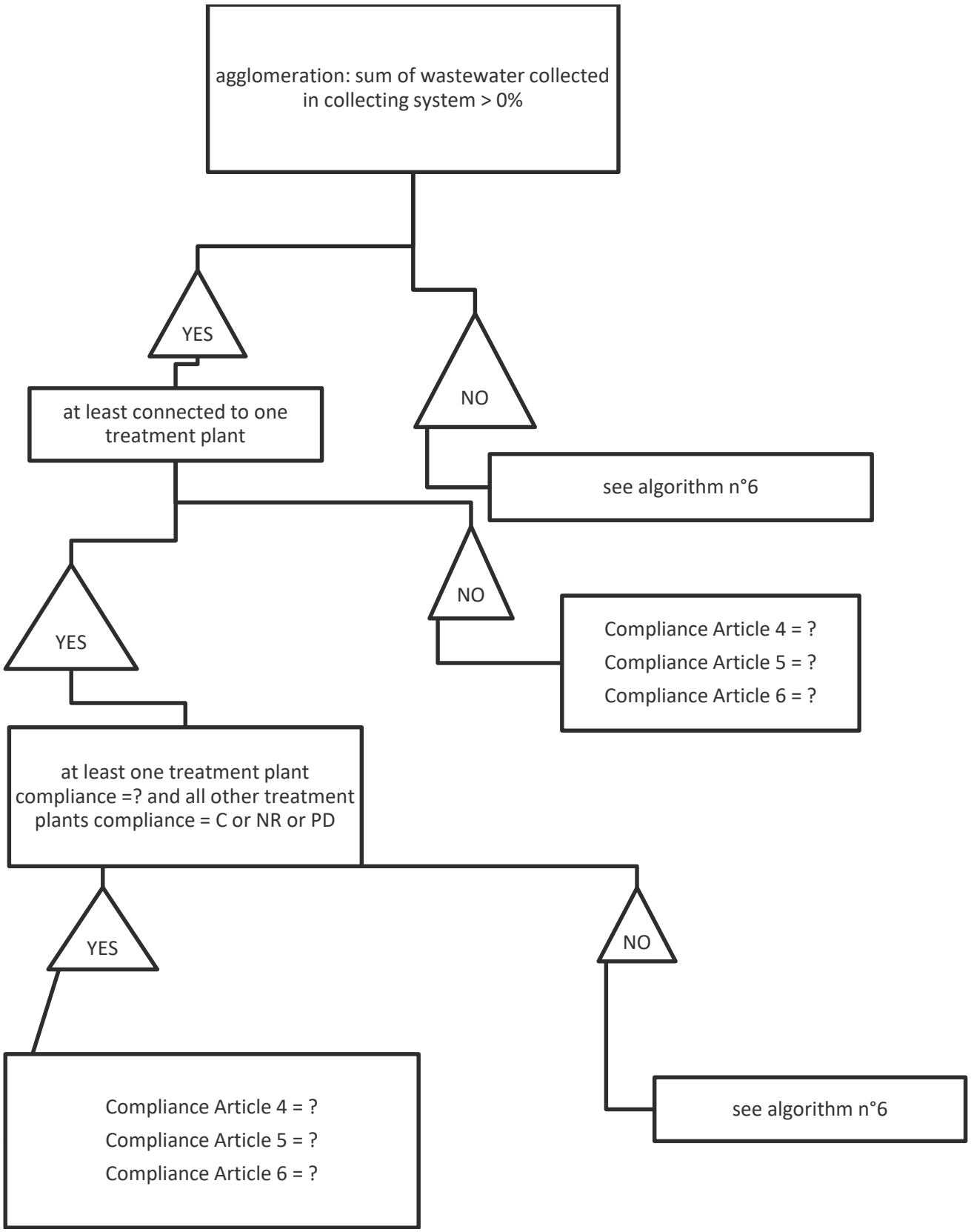
3.7 Algorithm n°3: Waste Water Treatment plant: treatment compliance and performance compliance, correction for transitional period



3.8 Algorithm n°4: Article 3 compliance (agglomeration)

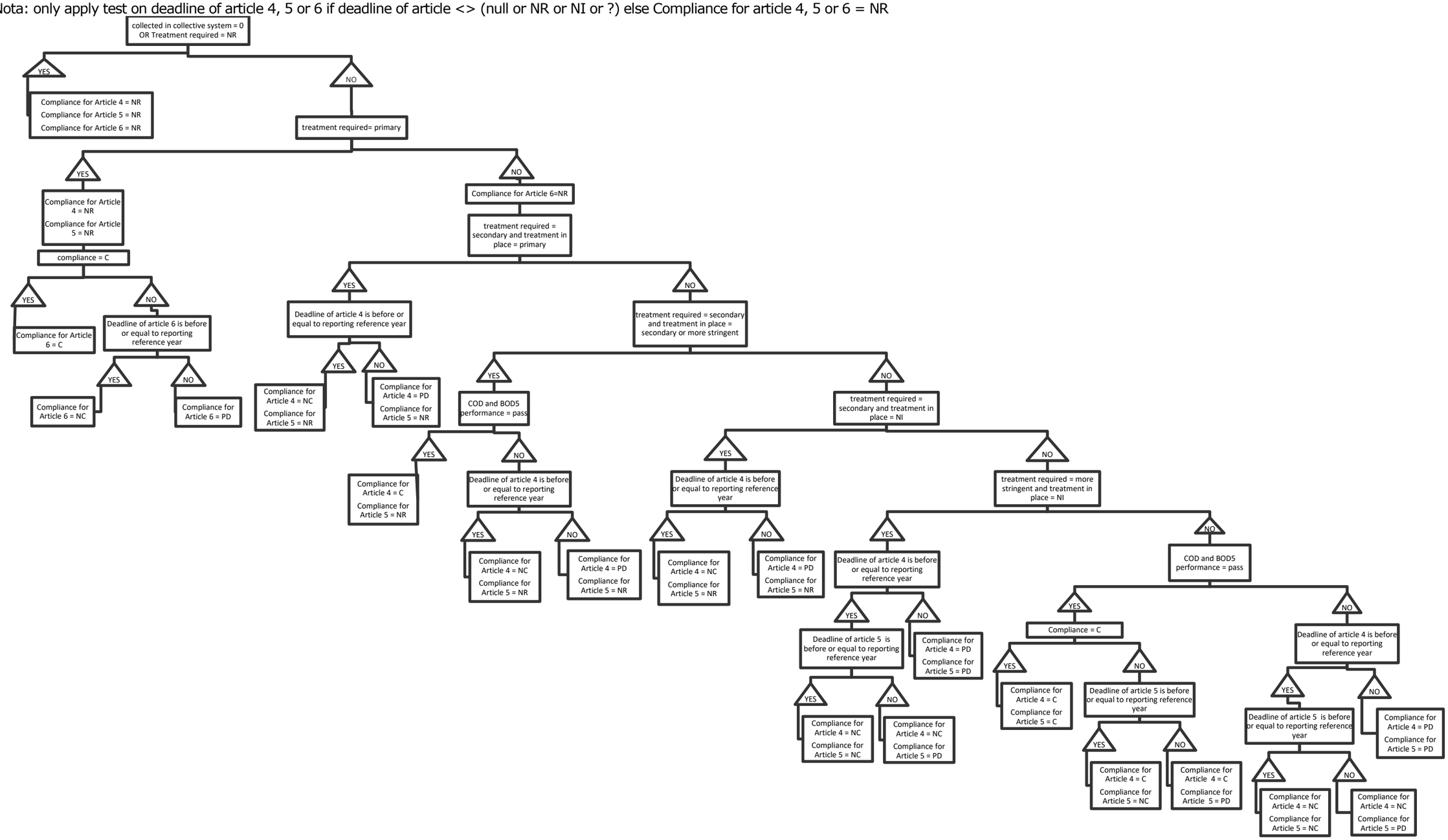


3.9 Algorithm n°5: Article 4, 5, 6 compliance exclusion of some cases (agglomeration)

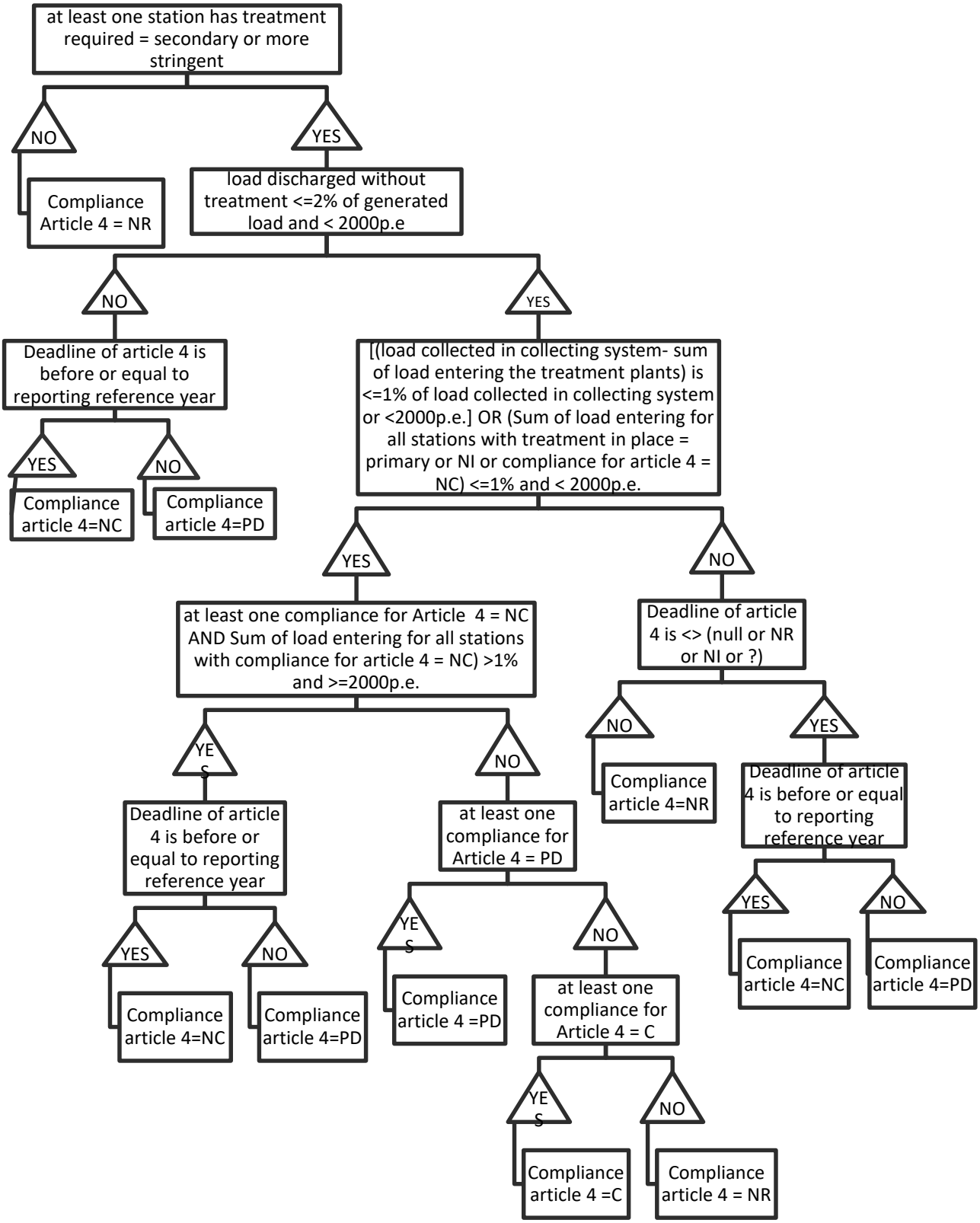


3.10 Algorithm n°6: Station compliance for Agglomeration Article 4, 5 and 6

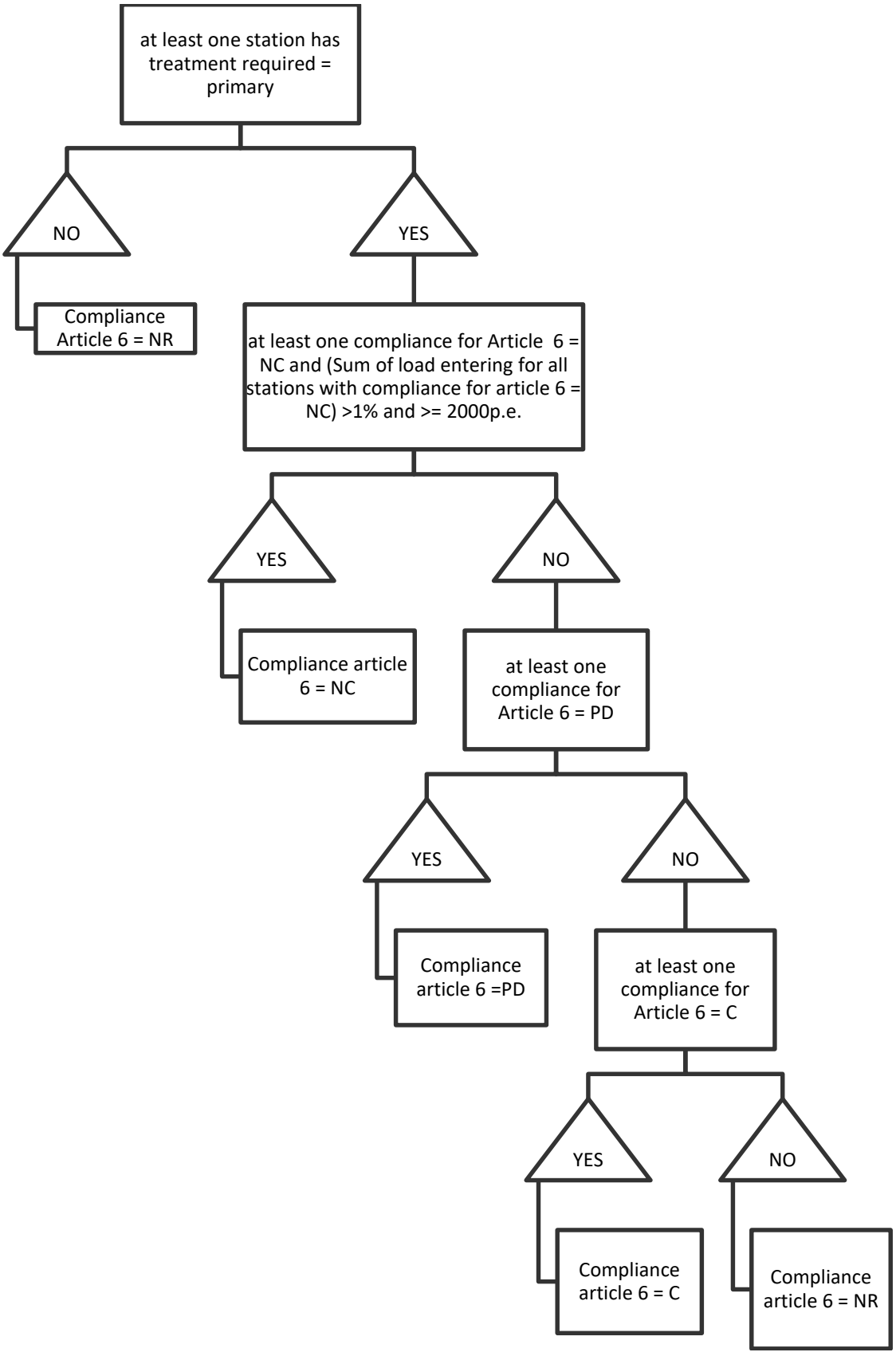
Nota: only apply test on deadline of article 4, 5 or 6 if deadline of article <> (null or NR or NI or ?) else Compliance for article 4, 5 or 6 = NR



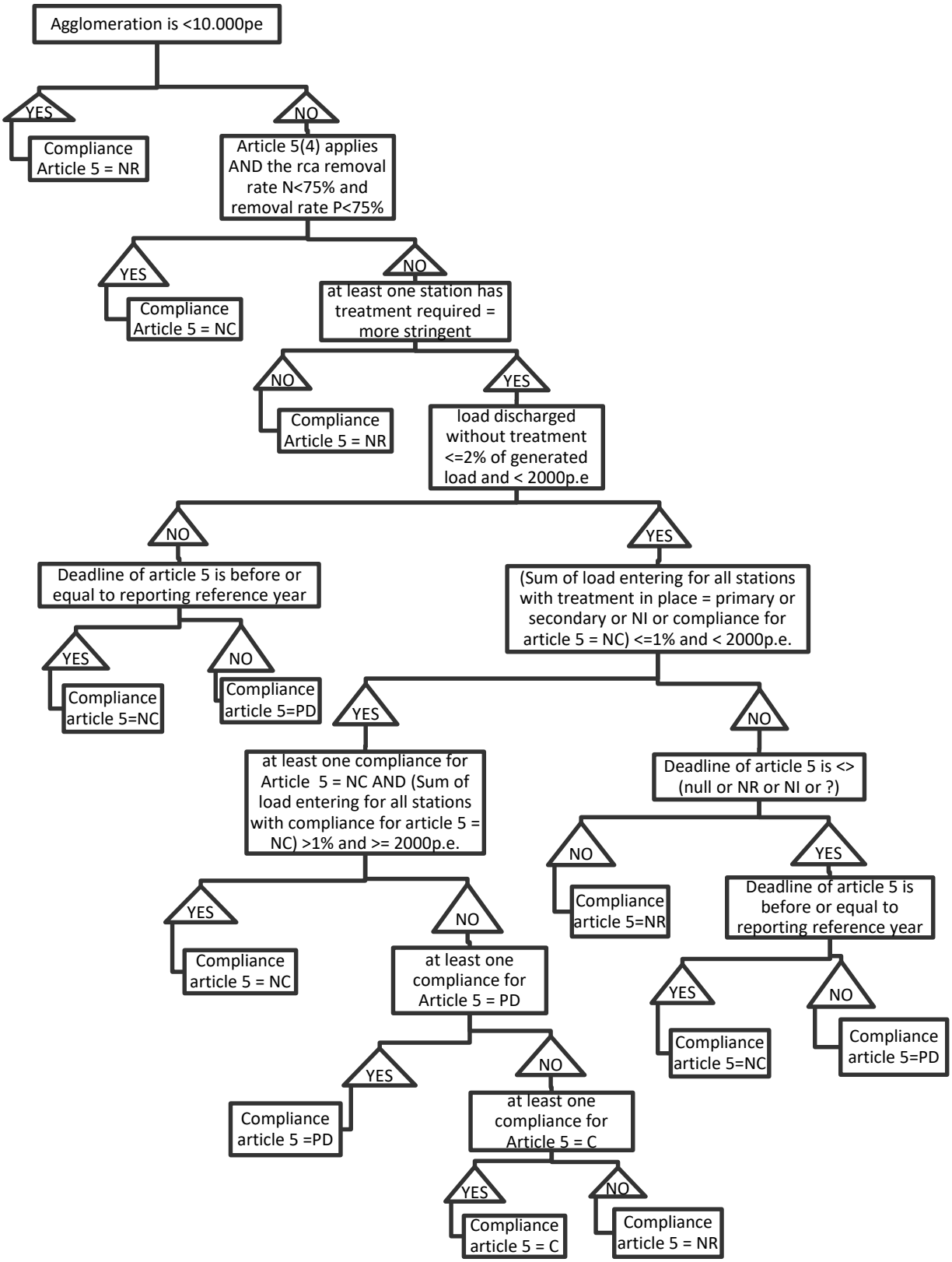
3.11 Algorithm n°7: Compliance of agglomeration for Article 4 only



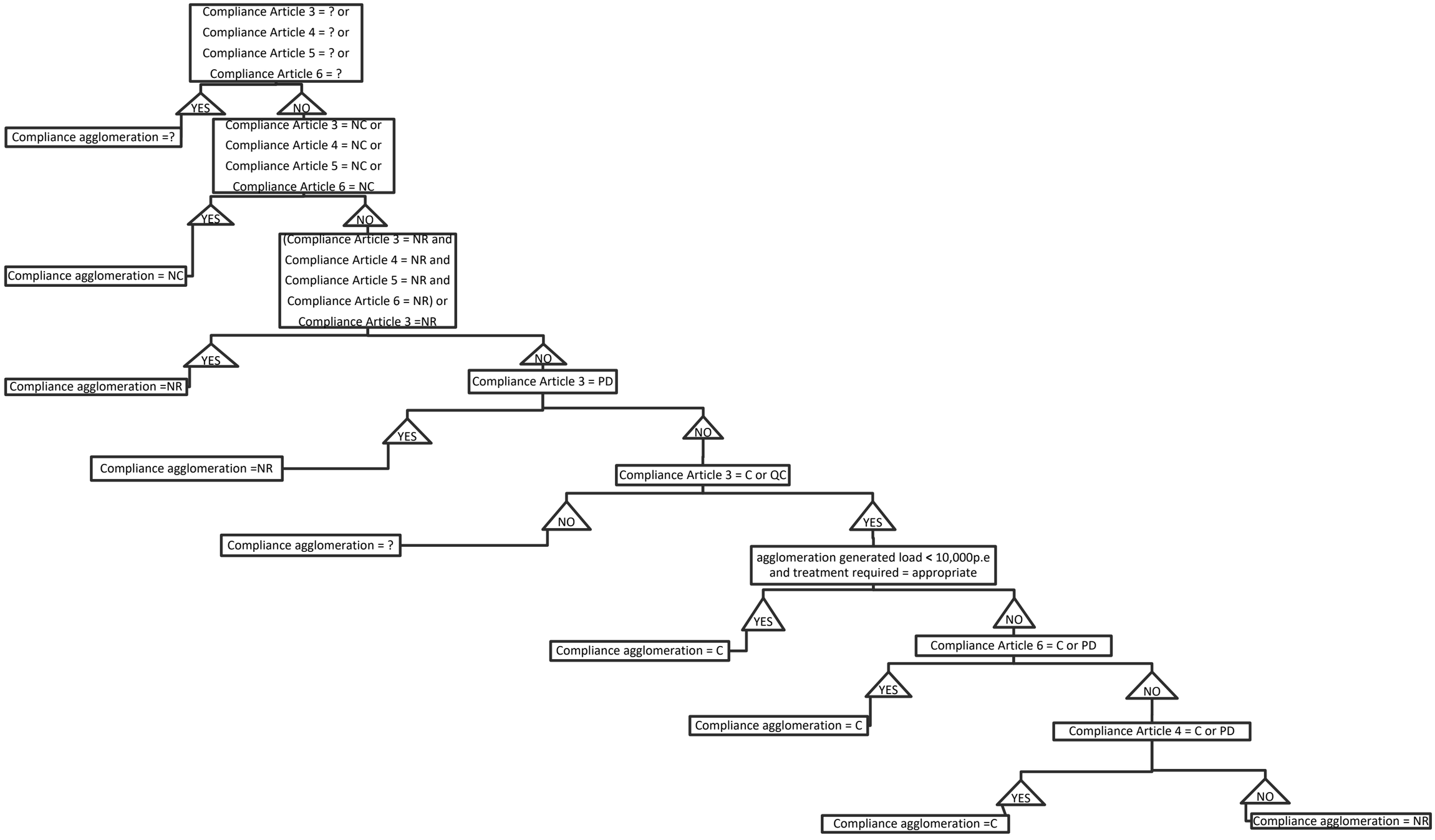
3.12 Algorithm n°8: Compliance of agglomeration for Article 6 only



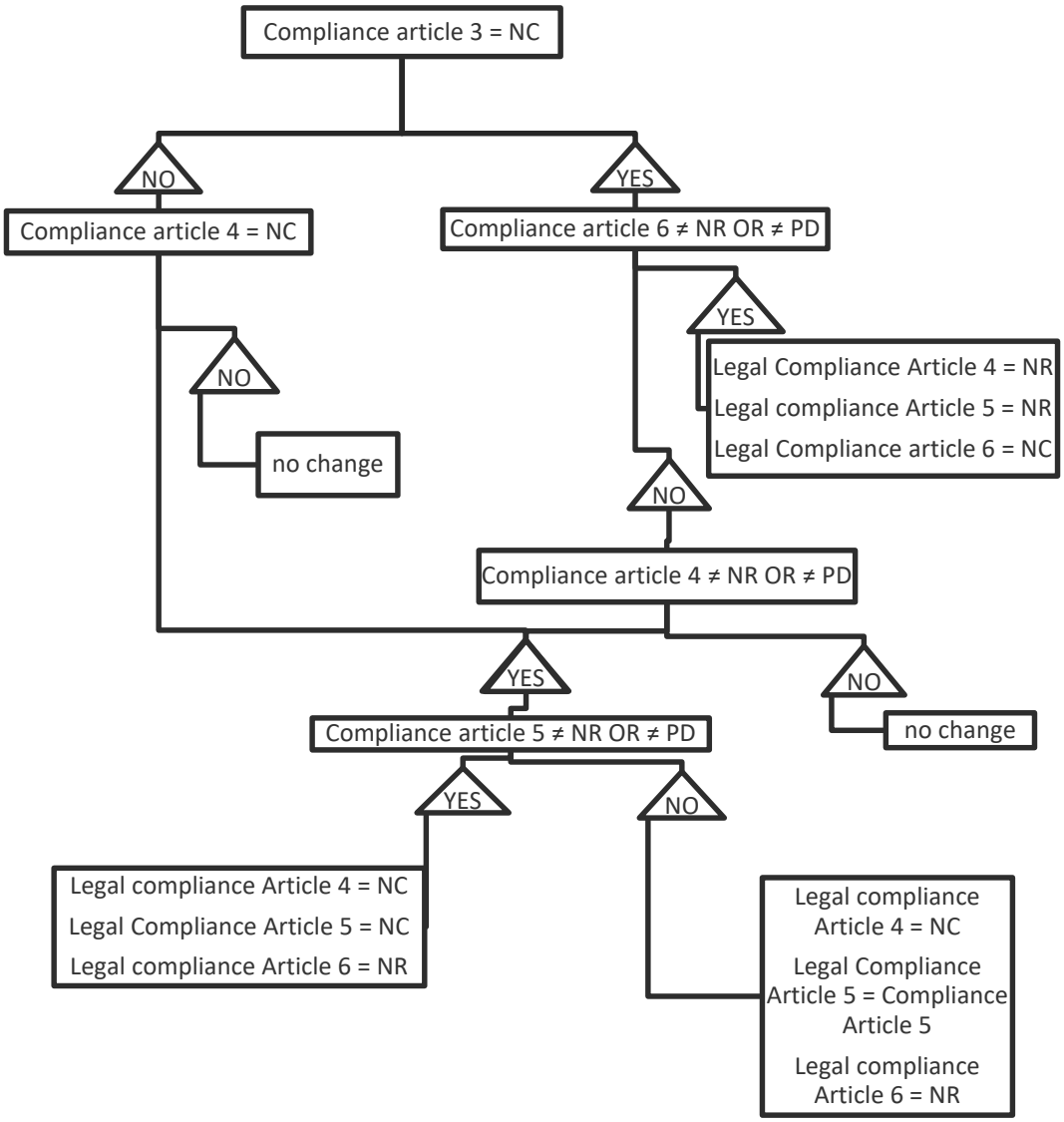
3.13 Algorithm n°9: Compliance of agglomeration for Article 5 only



3.14 Algorithm n°10: Hierarchical compliance: overall compliance (agglomeration)



3.15 Algorithm n°11: Hierarchical compliance: Legal compliance of individual articles 4, 5 & 6 (agglomeration)



3.16 Annexe: fields in data dictionary

This annexe lists the fields of the data dictionary of the reporting due for the year 2016[1] used in the algorithms. By default it is considered the links between agglomeration(s), treatment plant(s), discharge point(s) and receiving area(s) are operational and allow use of the fields listed, they are therefore not repeated in the hereunder for each algorithm. Each algorithm creates information which can be reused in one or more of the following algorithms (ex: treatment required, performance, compliance), these are not listed here.

3.16.1 Algorithm n°1: Waste Water Treatment plant: treatment required

ID in data dictionary	Column name	Column definition
3.13.4 & 3.13.1	dcpCode and dcpstate=1	ID of the discharge point & Status of the discharge point
3.10.8	aggGenerated	Generated load (p.e.), size of the agglomeration
3.13.11	dcpTypeOfReceivingArea	Type of receiving area into which the treated wastewater is discharged.
3.13.9	dcpWaterBodyType	Type of the water body into which waste water is discharged.

3.16.2 Algorithm n°1: Waste Water Treatment plant: treatment required (sensitive areas)

ID in data dictionary	Column name	Column definition
3.10.8	aggGenerated	Generated load (p.e.), size of the agglomeration
3.13.9	dcpWaterBodyType	Type of the water body into which waste water is discharged.
3.13.11	dcpTypeOfReceivingArea	Type of receiving area into which the treated wastewater is discharged.
3.4.6	rcaSpZTyp	Sub-type of receiving area
3.5.3	rcaParameter	Name of the receiving area parameter
3.4.7	rcaParameterN	Parameters subject to More Stringent Treatment: N
3.4.8	rcaParameterP	Parameters subject to More Stringent Treatment: P
3.4.9	rcaParameterM	Parameters subject to More Stringent Treatment: M
3.4.10	rcaParameterOther	Parameters subject to More Stringent Treatment: Other

3.16.3 Algorithm n°1: Waste Water Treatment plant: treatment required (Catchment of sensitive areas)

ID in data dictionary	Column name	Column definition
3.4.6	rcaSpZTyp	Sub-type of receiving area
3.5.3	rcaParameter	Name of the receiving area parameter
3.4.7	rcaParameterN	Parameters subject to More Stringent Treatment: N
3.4.8	rcaParameterP	Parameters subject to More Stringent Treatment: P
3.4.10	rcaParameterOther	Parameters subject to More Stringent Treatment: Other

[1] Source: Data Dictionary - Definition of Urban Waste Water Treatment Directive reporting under Article 15 – review dataset - Version: July 2017, EEA

3.16.4 Algorithm n°2: Waste Water Treatment plant: treatment compliance and performance compliance (except more stringent treatment)

ID in data dictionary	Column name	Column definition
3.11.14	uwwPrimaryTreatment	Primary Treatment
3.11.15	uwwSecondaryTreatment	Secondary Treatment
3.11.28	uwwTSSPerf	Treatment performance: TSS
3.11.26	uwwBODPerf	Treatment performance: BOD5
3.11.27	uwwCODPerf	Treatment performance: COD

3.16.5 Algorithm n°2: Waste Water Treatment plant: treatment compliance and performance compliance (more stringent treatment 1/2)

ID in data dictionary	Column name	Column definition
3.5.3	rcaParameter	Name of the receiving area parameter
3.4.7	rcaParameterN	Parameters subject to More Stringent Treatment: N
3.4.8	rcaParameterP	Parameters subject to More Stringent Treatment: P
3.11.15	uwwSecondaryTreatment	Secondary Treatment
3.11.16	uwwOtherTreatment	More stringent treatment
3.11.17	uwwNRemoval	N-Removal
3.11.18	uwwPRemoval	P-Removal
3.11.26	uwwBODPerf	Treatment performance: BOD5
3.11.27	uwwCODPerf	Treatment performance: COD
3.11.29	uwwNTotPerf	Treatment performance: N
3.11.30	uwwPTotPerf	Treatment performance: P

3.16.6 Algorithm n°2: Waste Water Treatment plant: treatment compliance and performance compliance (more stringent treatment 2/2)

ID in data dictionary	Column name	Column definition
3.5.3	rcaParameter	Name of the receiving area parameter
3.4.7	rcaParameterN	Parameters subject to More Stringent Treatment: N
3.4.8	rcaParameterP	Parameters subject to More Stringent Treatment: P
3.4.10	rcaParameterOther	Parameters subject to More Stringent Treatment: Other
3.11.15	uwwSecondaryTreatment	Secondary Treatment
3.11.16	uwwOtherTreatment	More stringent treatment
3.11.17	uwwNRemoval	N-Removal
3.11.18	uwwPRemoval	P-Removal
3.11.19	uwwUV	UV
3.11.20	uwwChlorination	Chlorination
3.11.21	uwwOzonation	Ozonation
3.11.22	uwwSandFiltration	Sand filtration
3.11.23	uwwMicroFiltration	Micro Filtration

ID in data dictionary	Column name	Column definition
3.11.24	uwwOther	Other type of more stringent treatment
3.11.26	uwwBODPerf	Treatment performance: BOD5
3.11.27	uwwCODPerf	Treatment performance: COD
3.11.29	uwwNTotPerf	Treatment performance: N
3.11.30	uwwPTotPerf	Treatment performance: P

3.16.7 Algorithm n°3: Waste Water Treatment plant: treatment compliance and performance compliance, correction for transitional period

ID in data dictionary	Column name	Column definition
3.2.4	repSituationAt	Specifying the end date of the period for which the data was reported.
3.10.14	aggDateArt3	Deadline for the implementation of requirements of article 3 of the UWWTD (provision of collecting system for agglomeration), and for Article 6 and Article 7.
3.10.15	aggDateArt4	Deadline for the implementation of requirements of article 4 of the UWWTD (provision of secondary treatment to urban waste water entering collecting system).
3.10.16	aggDateArt5	Deadline for the implementation of requirements of article 5 of the UWWTD (provision of more stringent treatment to urban waste water entering collecting system and being discharge after a treatment into sensitive areas or their catchments).

3.16.8 Algorithm n°4: Article 3 compliance (agglomeration)

ID in data dictionary	Column name	Column definition
3.10.8	aggGenerated	Generated load (p.e.), size of the agglomeration
3.10.17	aggC1	Rate of generated load of agglomeration collected through collecting system (% of the agglomeration size – aggGenerated).
3.10.19	aggC2	Rate of generated load of agglomeration addressed through Individual Appropriate Systems - IAS (% of the agglomeration size – aggGenerated).
3.10.21	aggPercWithoutTreatment	Rate of generated load of agglomeration not collected through collecting systems and not addressed through IAS (% of the agglomeration size – aggGenerated).
3.10.14	aggDateArt3	Deadline for the implementation of requirements of article 3 of the UWWTD (provision of collecting system for agglomeration), and for Article 6 and Article 7.

3.16.9 Algorithm n°5: Article 4, 5, 6 compliance exclusion of some cases (agglomeration)

ID in data dictionary	Column name	Column definition
3.12.6	aucPercEnteringUWWTP	Share (%) of generated load of agglomeration collected in collecting system and entering particular plant.
3.12.4	aucAggCode	ID of the agglomeration that is served by the

3.16.10 Algorithm n°6: Station compliance for Agglomeration Article 4, 5 and 6

ID in data dictionary	Column name	Column definition
3.10.14	aggC1	Rate of generated load of agglomeration collected through collecting system (% of the agglomeration size – aggGenerated).
3.11.26	uwwBODPerf	Treatment performance: BOD5
3.11.27	uwwCODPerf	Treatment performance: COD
3.2.4	repSituationAt	Specifying the end date of the period for which the data was reported.
3.10.14	aggDateArt3	Deadline for the implementation of requirements of article 3 of the UWWTD (provision of collecting system for agglomeration), and for Article 6 and Article 7.
3.10.15	aggDateArt4	Deadline for the implementation of requirements of article 4 of the UWWTD (provision of secondary treatment to urban waste water entering collecting system).
3.10.16	aggDateArt5	Deadline for the implementation of requirements of article 5 of the UWWTD (provision of more stringent treatment to urban waste water entering collecting system and being discharge after a treatment into sensitive areas or their catchments).

3.16.11 Algorithm n°7: Compliance of agglomeration for Article 4 only

ID in data dictionary	Column name	Column definition
3.10.8	aggGenerated	Generated load (p.e.), size of the agglomeration
3.10.17	aggC1	Rate of generated load of agglomeration collected through collecting system (% of the agglomeration size – aggGenerated).
3.11.12	uwwLoadEnteringUWWTP	Load entering UWWTP (p.e.)
3.2.4	repSituationAt	Specifying the end date of the period for which the data was reported.
3.10.15	aggDateArt4	Deadline for the implementation of requirements of article 4 of the UWWTD (provision of secondary treatment to urban waste water entering collecting system).

3.16.12 Algorithm n°8: Compliance of agglomeration for Article 6 only

ID in data dictionary	Column name	Column definition
3.10.8	aggGenerated	Generated load (p.e.), size of the agglomeration
3.10.17	aggC1	Rate of generated load of agglomeration collected through collecting system (% of the agglomeration size – aggGenerated).
3.11.12	uwwLoadEnteringUWWTP	Load entering UWWTP (p.e.)

3.16.13 Algorithm n°9: Compliance of agglomeration for Article 5 only

ID in data dictionary	Column name	Column definition
3.10.8	aggGenerated	Generated load (p.e.), size of the agglomeration
3.4.6	rcaSpZTyp	Sub-type of receiving area
3.10.17	aggC1	Rate of generated load of agglomeration collected through collecting system (% of the agglomeration size – aggGenerated).
3.11.12	uwwLoadEnteringUWWTP	Load entering UWWTP (p.e.)
3.6.6	rcaNIncoming54	Aggregated incoming loads (tons/year) N-tot of the UWWTPs (p.e.) located and discharging within the article 5.4 area.
3.6.7	rcaNDischarged54	Aggregated discharged loads (tons/year) N-tot of the UWWTPs (p.e.) located and discharging within the article 5.4 area.
3.6.8	rcaPIncoming54	Aggregated incoming loads (tons/year) P-tot of the UWWTPs (p.e.) located and discharging within the article 5.4 area.
3.6.9	rcaPDischarged54	Aggregated discharged loads (tons/year) P-tot of the UWWTPs (p.e.) located and discharging within the article 5.4 area.
3.2.4	repSituationAt	Specifying the end date of the period for which the data was reported.
3.10.16	aggDateArt5	Deadline for the implementation of requirements of article 5 of the UWWTD (provision of more stringent treatment to urban waste water entering collecting system and being discharge after a treatment into sensitive areas or their catchments).

3.16.14 Algorithm n°10: Hierarchical compliance: overall compliance (agglomeration)

None

3.16.15 Algorithm n°11: Hierarchical compliance: Legal compliance of individual articles 4, 5 & 6 (agglomeration)

None