FOCUSPEARL version 5.5.5 - technical description of database and interface

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FOCUSPEARL version 5.5.5 - technical description of the database

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This document contributes to the body of knowledge which will be incorporated in more policy-oriented publications such as the National Nature Outlook and the Assessment of the Human Environment reports, and thematic assessments.

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FOCUSPEARL version 5.5.5 - technical description of the database

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Abstract
Braakhekke, M. C., D. van Kraalingen, A. Tiktak, F. van den Berg, J.J.T.I. Boesten (2022). *FOCUSPEARL version 5.5.5 - technical description of the database.* Wettelijke Onderzoekstaken Natuur & Milieu, WOt-technical report 230.

FOCUSPEARL 5.5.5 is a Windows application that allows users to perform simulations to assess pesticide fate in soil for use in regulatory risk assessment in the European Union. It includes the PEARL and SWAP numerical models, a graphical user interface (GUI) and a database storing information defining simulation runs—including all input data for the nine FOCUS groundwater scenarios. This report provides a technical description of the FOCUSPEARL 5.5.5 database and its relationship with the GUI. It is intended for developers and maintainers of the application, to assist further development and quality assurance.

FOCUSPEARL 5.5.5 is een Windows-applicatie waarmee gebruikers simulaties van het gedrag van pesticiden in de bodem kunnen uitvoeren voor risicobeoordeling voor pesticideregistratie. Het omvat de PEARL en SWAP numerieke modellen, een grafische gebruikersinterface, en een database voor het opslaan van de benodigde gegevens voor simulatie-runs, waaronder inputdata voor de negen FOCUS grondwater-scenario's. Dit rapport geeft een beschrijving van de FOCUSPEARL 5.5.5-database en de relatie met de gebruikersinterface. Het is bedoeld voor ontwikkelaars en beheerders van de applicatie en dient ter ondersteuning van verdere ontwikkeling en kwaliteitsborging.

Keywords: crop protection product, database structure, groundwater, leaching, pesticide, software design

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Summary

FOCUSPEARL 5.5.5 is a Windows application that allows users to set up, perform and analyse the results of simulations performed using the PEARL model to assess pesticide fate in soil. Its primary goal is to facilitate runs for the FOCUS scenarios to assess pesticide leaching to groundwater and EFSA ("PECsoil") scenarios to assess the exposure of soil organisms to pesticides.

At its core, FOCUSPEARL 5.5.5 comprises the PEARL and SWAP numerical models for pesticide fate and soil hydrology, respectively. Additionally, FOCUSPEARL features a graphical user interface (GUI), allowing the user to construct or edit all relevant settings and input data that define simulation runs, perform these runs, and visualise the output with graphs using the XYWin application (included with the application). These data, as well as information needed to construct the GUI, are stored in a Firebird database as a .fdb file. This database also stores all relevant input data needed for the nine FOCUS groundwater scenarios. After installation a default database is used, but the application features functionality for working with different databases on the same system, including opening a different database, saving the current database in a new location, and creating a new database. The directory in which a database file is stored, referred to as the database directory, also includes the root run directory, which contains a subdirectory for each run in the database. Each run subdirectory stores the input and output files of the PEARL and SWAP models, as well as several files needed for creating graphs with XYWin.

Upon starting the calculation for one or more runs, FOCUSPEARL broadly carries out the following actions: (1) save settings for the runs selected for the calculation and check their integrity, (2) create the necessary input files for PEARL and SWAP and (3) start the PEARL simulations using the number of processors selected by the user. After the simulations have finished, the existence of the output files is verified and any errors reported by PEARL are shown in the GUI. If the runs have completed successfully, the user can generate a HTML summary report or create graphs using XYWin.

The database is implemented in Firebird and follows a relational model. The data are organised in 74 tables, for which the rows represent different entities and the columns represent their attributes. The database includes static (non-modifiable), user-modifiable and application-modifiable tables. Static and application-modifiable tables are needed by the application, for example to construct the GUI, while user-modifiable tables store inputs and settings for the simulation runs. Note that the data in the user-modifiable tables included with the FOCUSPEARL application (mainly related to the FOCUS groundwater scenarios) cannot be removed or modified. The tables are strongly linked to various elements of the GUI and can be grouped into the following categories: (1) application, deposition and initial conditions; (2) crops; (3) hydrology; (4) irrigation and tillage; (5) location and soil profile; (6) meteorology; (7) output and graphs; (8) runs; (9) wizard and (10) miscellaneous.

Samenvatting

FOCUSPEARL 5.5.5 is een Windows-applicatie waarmee gebruikers simulaties van het gedrag van pesticiden in de bodem kunnen opzetten, uitvoeren, en analyseren. De belangrijkste functie van de applicatie is het faciliteren van simulaties voor de FOCUS-scenario's voor uitspoeling van pesticiden naar het grondwater en de EFSA-scenario's ("PEC-soil") voor blootstelling van bodemorganismen aan pesticiden.

De kern van FOCUSPEARL 5.5.5. wordt gevormd door de numerieke modellen PEARL en SWAP voor respectievelijk pesticidegedrag en bodemhydrologie. Daarnaast is FOCUSPEARL voorzien van een grafische gebruikersinterface (GUI), waarmee gebruikers alle relevante instellingen en invoerdata voor simulatie-runs kunnen opgeven, deze runs kunnen uitvoeren, en de resultaten ervan kunnen visualiseren met behulp van het XYWin-programma (meegeleverd met de applicatie). Deze data, alsmede alle benodigde data om de GUI te construeren, worden bewaard in een Firebird-database, die op de harde schrijf is opgeslagen als een .fdb-bestand. Deze database bevat ook alle relevante invoerdata die nodig zijn voor de negen FOCUS-grondwaterscenario's. Na installatie van FOCUSPEARL wordt een standaard, centrale database gebruikt, maar de applicatie heeft de functionaliteit om met verschillende databases op hetzelfde systeem te werken. Hieronder zijn het openen van een andere reeds bestaande database, het opslaan van de huidige database in een andere locatie, en het aanmaken van een nieuwe database. De map waar het database-bestand is opgeslagen (de "database-map") bevat ook de hoofdrun-map die een submap bevat voor elke run in de database. In deze submap zijn alle input- en output-files van PEARL en SWAP opgeslagen, alsmede enkele files die nodig zijn voor het maken van grafieken met XYWin.

Bij het starten van de berekeningen voor één of meerder runs voert FOCUSPEARL grofweg de volgende stappen uit: (1) opslaan van de instellingen van de runs en verifiëren van de integriteit; (2) aanmaken van de benodigde invoerbestanden voor PEARL en SWAP en; (3) starten van de PEARL-simulaties op één of meerdere processors, zoals aangegeven door de gebruiker. Als de simulaties klaar zijn wordt het bestaan van de uitvoerbestanden geverifieerd en indien er foutmeldingen door PEARL zijn gemeld worden deze getoond in de GUI. Als de runs succesvol zijn afgerond kan de gebruiker een HTML-overzichtsrapport genereren of grafieken aanmaken met XYWin.

De database is geïmplementeerd in Firebird en volgt een relationeel model. De data is georganiseerd in 74 tabellen, waarvan de rijen verschillende entiteiten representeren en de kolommen eigenschappen van deze entiteiten. De database bevat statische (niet-aanpasbare), gebruiker-aanpasbare en applicatie-aanpasbare tabellen. Statische en applicatie-aanpasbare tabellen bevatten data die nodig zijn om de GUI te construeren. Gebruiker-aanpasbare tabellen bevatten invoerdata en instellingen voor de simulatieruns. Data in de gebruiker-aanpasbare tabellen die worden meegeleverd met FOCUSPEARL (voornamelijk voor de FOCUS grondwaterscenario's) kunnen niet verwijderd of aangepast worden. De tabellen hebben een sterke relatie met verschillende elementen van de GUI en kunnen worden ingedeeld in de volgende categorieën: (1) toediening, depositie, en initiële condities; (2) gewassen; (3) hydrologie; (4) irrigatie en ploegen; (5) locatie en bodemprofiel; (6) meteorologie; (7) uitvoer en grafieken; (8) runs; (9) wizard en; (10) divers.

1 Introduction

FOCUSPEARL 5.5.5 is a Windows application that allows users to set up, perform and analyse the results of simulations performed using the PEARL model to assess pesticide fate in soil. Its primary goal is to facilitate runs for the FOCUS scenarios to assess pesticide leaching to groundwater and EFSA ("PECsoil") scenarios to assess the exposure of soil organisms to pesticides. These scenarios comprise a set of combinations of weather, soil and cropping data representative of different regions of the European Union (EU). The assessment of the leaching potential or exposure of soil organisms for one or more of these scenarios is part of the review process for the authorisation of active substances (i.e., pesticides) in the EU and the Netherlands.

At its core, FOCUSPEARL comprises the PEARL model, which, in turn, runs the SWAP model to obtain the soil water fluxes needed for simulating pesticide fate. PEARL is a command line application controlled by text input files. While it is possible for the user to perform PEARL simulations directly, this is considered insufficiently user-friendly for typical users. Therefore, the FOCUSPEARL application was developed to provide a graphical user interface (GUI) that allows users to easily set up and perform PEARL runs for the FOCUS groundwater and (from version 5.5.5) PECsoil scenarios. Moreover, since all model input data can be specified through the interface, it also allows users to set up custom scenarios with different input data.

The Wageningen Environmental Research guidelines for quality assurance require that proper documentation is provided for models and databases used in policy development and implementation. Various documents related to FOCUSPEARL have previously been published. The scenarios and guidelines for how to use them were described by the European Commission (2014) for FOCUS groundwater and by the European Food Safety Authority (2017) for PECsoil. The concepts of the PEARL model were described by van den Berg et al. (2016). Finally, the instructions for the use of FOCUSPEARL are given in the user manual (van den Berg et al., 2019). This report complements the existing documentation with a technical description of the FOCUSPEARL database and its relationship with the GUI. Since the database plays a central role in the FOCUSPEARL application, a description of its design will provide insight into the workings of the application, thereby contributing to quality assurance and further development. As such, this document is intended for developers and maintainers of FOCUSPEARL—not for typical users of the application. For these, the above-mentioned sources are sufficient. Note that it is explicitly not the aim of this document to provide a technical documentation of the source code of PEARL or the GUI, since neither of these are currently publicly available.

The rest of this report is structured as follows. Chapter 2 gives a high-level overview of the components of the FOCUSPEARL application; the contents of the database directory; and the actions carried out by the application on start-up, when executing runs and during postprocessing of the results. Chapter 3 describes the database and gives an overview of all tables. It is assumed that the reader is familiar with the FOCUSPEARL user interface and the FOCUS and EFSA scenarios for groundwater and PECsoil.

2 The FOCUSPEARL application

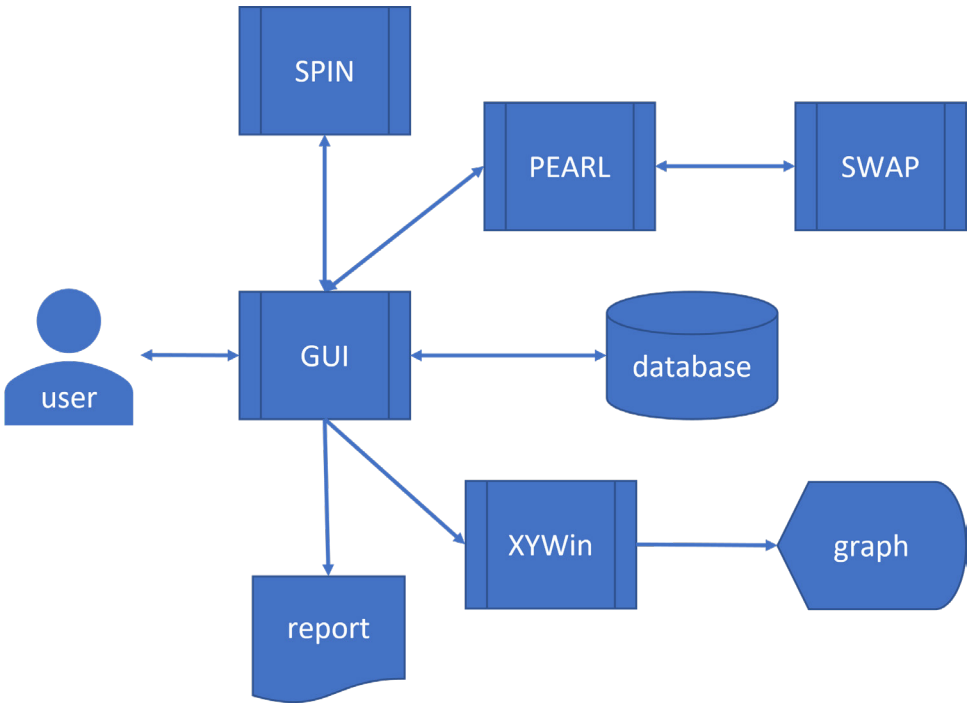

Figure 2.1 *Overview of the components of the FOCUSPEARL application.*

2.1 Overview

Figure 2.1 provides a high-level overview of the components of the FOCUSPEARL application and their interactions. FOCUSPEARL includes four executable programs: the FOCUSPEARL GUI, the PEARL model, the SWAP model and the XYWin program for creating graphs. With typical usage, the user only interacts directly with the GUI. Note that the GUI does not control SWAP; this is handled by PEARL. The GUI also interacts with SPIN to obtain substance information. SPIN (van Kraalingen et al., 2020) is a separate application developed by WEnR which is responsible for storing substances including the properties needed by pesticide fate models used in registration. This program must be installed in order to run FOCUSPEARL.

The database is stored on disk as a Firebird (.fdb) file and directly accessed by the GUI to retrieve and store information. When first opening FOCUSPEARL, a default database is opened, which is located in directory selected by the user during the installation process. Since version 5.5.5, FOCUSPEARL also supports also opening other database files. When the GUI is closed, the location of the last opened database is stored in the Windows registry. This database is reopened when FOCUSPEARL is started at a later time. The structure of the database is discussed in chapter 3.

2.2 The FOCUSPEARL database directory

The FOCUSPEARL database directory is linked to a specific database and stores user-specific files. This includes the FOCUSPEARL database file, and files related to the FOCUSPEARL runs stored in the database. The database directory is the directory in which the database file is stored. For the default database, this location is selected by the user during the FOCUSPEARL installation process.

PearlDB.fdb	FOCUSPEARL database file
PearlDB.busy	Lock file (only when FOCUSPEARL session is active)
PearlDB	Root run directory
1	Run directory for run 1
1.prl	PEARL configuration file
chat-m.met	Daily meteorology data
1.bot	Bottom boundary time series data (optional)
1.irr	Irrigation time series data (optional)
run.bat	A command file for manual execution
swap.ok	Indicates successful termination of SWAP
pearl.ok	Indicates successful termination of PEARL
1.log	Calculation log of the model
1.sum	PEARL summary calculation results
1.out	Detailed PEARL calculation results
1.SWE	Indicates successful termination of SWAP
1.err	File stating PEARL error message (only if run failed)
XYCOLOR.SET	File created when viewing graphs with XYWin
data-*.xy	Files created when viewing graphs with XYWin
UserDefinedGraph.set	File created when viewing user-defined graphs with XYWin
*.job	Files created when viewing predefined graphs with XYWin
2	Run directory for run 2
PersamExamples	
Example_01.ptf	Example PERSAM transfer file

Figure 2.2 *Contents of an example FOCUSPEARL database directory. The root run directory contains two runs, with only the contents for run 1 shown. The font colour of the file name indicates when the file is created; blue: before the PEARL run(s); green: during the PEARL run(s); brown: when viewing graphs. The name of the meteorology input file depends on the selected meteorological station—in this case, Chateaudun. Several pre-run files are optional, depending on the run definition. Multiple XYWin-related files with extensions .xy and .job may exist.*

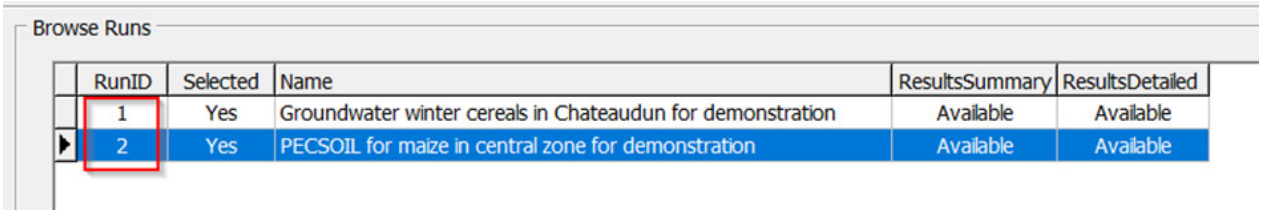

Figure 2.3 *The run ID in the main FOCUSPEARL window.*

Figure 2.2 gives an overview of the contents of the database directory. In addition to the database file, it contains the root run directory, which is a subdirectory with the same name as the database file, containing the calculations, input and output of that database. If the root run directory does not exist (e.g., when a new database file is opened), it will be created. The root run directory contains subdirectories for each run present in the database, named after the run ID number, as indicated in the GUI (Figure 2.3). Each run directory will contain all necessary input as made by the GUI, and all output after the successful calculation of the run. The names of some of these files are based on the run ID. An overview of the files is given in Figure 2.2.

The default database directory, created during the installation of FOCUSPEARL, additionally contains a subdirectory with an example PERSAM transfer file that can be used to generate an example PECsoil run.

2.3 Actions carried out by FOCUSPEARL

2.3.1 Start-up of the FOCUSPEARL GUI

The following actions are performed upon GUI start-up:

1. Connect with the SPIN application
2. If necessary, add the FOCUSPEARL example substances (including metabolite relations) to SPIN
3. Open the most recently opened database (previous FOCUSPEARL session)
4. Check if substances in SPIN have been modified and, if so, invalidate the possible results of relevant runs in the database
5. Initialise the GUI elements and wait for user actions

2.3.2 Preparation and execution of PEARL runs

Below we give, in broad terms, the sequence of events that take place when the user starts a run by clicking the "Calculate" button.

1. Initial preparations:
   - 1.1 If necessary, save all unsaved changes to the database
   - 1.2 Check for the complete definition and integrity of the selected runs
   - 1.3 If more than one run is selected, ask the user for run options (e.g., the number of processor cores to use)
   - 1.4 Clear the text fields "Summary results", "Detailed results", and "PEARL error messages" on the tab "Run Status" in the main window

2. Creation of input files:
   - 2.1 Create the PEARL configuration (.prl) file
   - 2.2 If necessary (depending on the selected run settings), create the bottom boundary condition (.bot) and/or irrigation (.irr) files
   - 2.3 Create the meteorology (.met) file
   - 2.4 Create the run.bat file

3. Run the PEARL executable (Pearlmodel.exe) for all selected runs and wait for termination

4. Scan for the various PEARL output files and set related text fields in the main window. The presence of the .sum and .out files is indicated in the "ResultsSummary" and "ResultsDetailed" columns in the "Browse Runs" table, as well as the fields "Summary results" and "Detailed results" on the tab "Run status", respectively. If the run has failed, this is indicated in the "ResultsSummary" and "ResultsDetailed" columns in the "Browse Runs" table, and the contents of the .err file are shown in the "PEARL error messages" field in the tab "Run status".

When multiple runs are selected for execution, the PEARL runs (step 3) are distributed over the number of threads chosen by the user (step 1.3). All other actions are carried out in a single thread.

2.3.3 Output processing

For failed runs, no additional actions are taken other than those described in step 4 above. If one or more runs have completed successfully, the user can choose to create reports based on the summary results of PEARL. Either a detailed report based on the summary results for a single run or an overview report of multiple runs (groundwater runs only) can be generated. In both cases, the GUI extracts the necessary information from the summary (.sum) output files of PEARL. The reports are in HTML format and stored in a temporary directory. Additionally, predefined or user-defined graphs can be created using the XYWin program based on the detailed output stored in the .out file. The GUI generates input files in the run directory (see Figure 2.2) for XYWin and runs the application to display the graphs.

3 The FOCUSPEARL database

3.1 Introduction

The FOCUSPEARL database stores all data required for the FOCUSPEARL application, most importantly the data defining the runs, including input for the PEARL and SWAP models and the XYWin application. The database is closely linked to the GUI; values or choices entered or selected by the user correspond directly to data fields in the database. The database includes data related to the FOCUS scenarios, as well as several example entries (e.g., example application schemes). These data are supplied with the application and cannot be removed or edited by the user; however, new data can be added for custom assessments. More information on the data related to the definition of runs can be found in the FOCUSPEARL manual.

A FOCUSPEARL session has exclusive access to the database file. When opening a database, FOCUSPEARL creates a lock file named after the database file, with the extension .busy, and locks this file to prevent deletion (see Figure 2.2). If this lock file already exists and cannot be removed, another FOCUSPEARL session is running and using the database file, which therefore cannot be opened.

3.2 Structure

The database is implemented in Firebird, with ODS version 11.2 (see https://firebirdsql.org/). This platform was chosen for the embedded database drivers it provides, facilitating access to the database from a Delphi application (Embarcadero, Delphi 10, Berlin) without prior installation of special database server software. This greatly simplifies the deployment process.

The database follows the relational model; the data are organised in 74 tables, of which the rows represent different entities and the columns represent the attributes of these entities. Each table has a primary key, which is a set of one or more attributes for which the values are guaranteed to be unique for each row. Primary keys are used for cross-references between tables (see below). The database contains three types of table: static (non-modifiable), user-modifiable and application-modifiable tables. Static tables are not modified, and store data required for the construction of the user interface. User-modifiable tables can be manipulated through the user interface, and generally store data defining the PEARL runs, including input data for the models. Users can add or remove rows and modify some or all attributes (some attributes are managed by the application). Note that the user-interface does not permit data related to the definition of the FOCUS scenarios to be removed or modified. Tables storing such data include an attribute LOCKED in order to identify these rows. Finally, a small number of tables are only modifiable by the application.

Links between tables exist when an attribute of a certain table (the child table) contains “foreign keys”, which correspond to the primary keys of entities (rows) defined in another table (the parent table). Consider, for example, the soil profile selected for a given location on GUI form “Locations”. In the database, this relationship is implemented by means of the attribute SOILPROFILECODE of the (child) table LOCATIONS, which specifies foreign keys that correspond to the primary key attribute SOILPROFILECODE in the (parent) table SOILPROFILES (Figure 3.1). The allowed values of a foreign key attribute in the child table are determined by the primary keys of the rows in the parent table. If a foreign key attribute of a child table is modifiable by the user, the related element in the GUI is always a drop-down list. If the parent table is modifiable by the user (such as with SOILPROFILES), selectable items can be added or removed from the drop-down list. Frequently, however, the parent table is static, and its purpose is simply to specify the allowed values of an attribute in the child table; for example, the table IRRIGATIONTYPES specifies the possible types of irrigation that can be selected for an irrigation scheme. Note that for the substance selected for a run (attribute SUBSTANCEGUID in table RUNS), the parent table is not part of the FOCUSPEARL database but of the SPIN database.

Table 3.1 gives an overview of all 74 tables in the database, grouped according to their contents. The tables that have relationships with others are depicted in Figures 3.2 and 3.3.

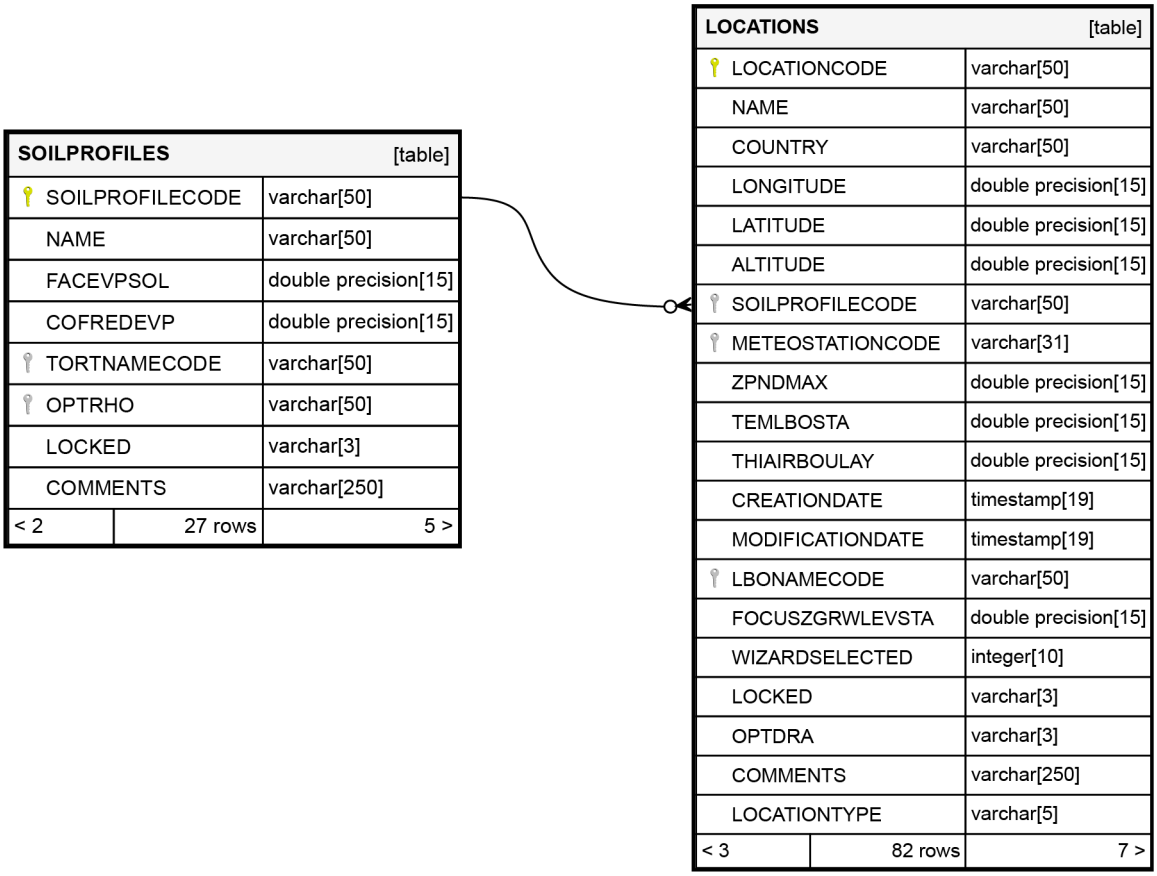

Figure 3.1 *Diagram of the relationship between the SOILPROFILES (parent) and LOCATIONS (child) tables in the FOCUSPEARL database. The boxes list attributes and their data types, with the green and grey key symbols indicating primary and foreign keys, respectively. In the lower left and right corners, the number of parent and child tables are indicated, respectively. Generated with SchemaSpy 6.1.1 (SchemaSpy Team, 2022).*

Table 3.1 *Overview of all 74 tables in the FOCUSPEARL database.*

Name	Description	Related GUI elements	Modifiable
	Application, deposition, and initial conditions		
APPLICATIONSABSOLUTE	Absolute applications	Form "Application schemes", Box "Browse absolute applications"	User
APPLICATIONSCHEMES	Application schemes	Form "Application schemes", Box "Browse Application schemes"	User
APPLICATIONSRELATIVE	Relative applications	Form "Application schemes"	User
APPLICATIONTYPES	Types of applications	Form "Application schemes", Tabs "Absolute Applications" and "Relative Applications"	No
CNTSYSEQL	Initial conditions for parent pesticide for soil layers in the equilibrium domain	Form "Initial conditions for parent pesticide", Box "Equilibrium domain"	User
CNTSYSNEQ	Initial conditions for the parent pesticide for separate soil layers in the non-equilibrium domain	Form "Initial conditions for parent pesticide", Box "Non-equilibrium domain"	User
CROPEVENTS	Possible crop events for the timing of relative applications (emergence, harvest)	Form "Application schemes", Tab "Relative Applications"	No
DEPOSITIONS	Deposition events in deposition schemes	Form "Deposition Schemes", Box "Depositions"	User
DEPOSITIONSCHEMES	Deposition schemes	Form "Deposition Schemes", Box "Browse Deposition Schemes"	User
OPTDELTIMEVTS	Options for the repeat interval for application events	Form "FOCUSPEARL 5.5.5", Box "Edit Run", Tab "Scenario", Drop-down list "Repeat interval for application events:"	No
	Crops		
CROPROOTDENSITIES	Root densities in soil layers	Form "Root Density"	User
CROPS	Crops	Form "Crops"	User
CULTIVATIONSEQUENCES	Crop calendars	Form "Crop calendar", Boxes "Browse Crop Calendars" and "Edit Crop Calendar"	User
CULTIVATIONSEQUENCEXCROPSA	Crop sequence of a crop calendar	Form "Crop calendar", Box "Browse Crops in Crop Calendar"	User
CULTIVATIONSEQUENCEXCROPSB	Stages in the crop calendars	Form "Crop stages"	User
OPTLENCRPS	Options for crop cycle	Form "Crop Stages", Box "Edit Crop Calendar", Drop-down list "Crop cycle"	No
	Hydrology		
DRAINAGES	Parameters for drainage levels	Form "Drainage"	User
LBONAMES	Types of lower boundary conditions	Form "Locations", Box "Edit Location"	No
LOCATIONLBODIRICHLETS	Links a location to the table for time-dependent pressure heads	Form "Lower Boundary Conditions", Tab "Pressure head lower boundary conditions"	User
LOCATIONLBODIRICHLETTS	Time-dependent pressure heads	Form "Lower Boundary Conditions", Tab "Pressure head lower boundary conditions"	User
LOCATIONLBOFLUXSINES	Sine lower boundary condition parameters for locations	Form "Lower Boundary Conditions", Tab "Sine function"	User
LOCATIONLBOGROUNDWATERS	Links a location to the table for time-dependent groundwater levels	Form "Lower Boundary Conditions", Tab "Time dependent groundwater level"	User
LOCATIONLBOGROUNDWATERTS	Time-dependent groundwater levels	Form "Lower Boundary Conditions", Tab "Time dependent groundwater level"	User
LOCATIONLBOHEADS	Parameters for the Cauchy lower boundary condition	Form "Lower Boundary Conditions", Tab "Cauchy"	User
LOCATIONLBOQHS	Parameters for the flux lower boundary condition	Form "Lower Boundary Conditions", Tab "Flux boundary condition"	User
OPTDRAINAGETYPES	Lateral drainage type options	Form "Drainage", Drop-down list "Type"	No
OPTHYDS	Options regarding SWAP run	Form "FOCUSPEARL 5.5.5", Box "Edit Run", Tab "SWAP hydrological Module", Drop-down list "Option hydrology"	No

Name	Description	Related GUI elements	Modifiable
OPTHYSTERESISCODES	Options regarding hysteresis	Form "FOCUSPEARL 5.5.5", Box "Edit Run", Tab "SWAP hydrological Module", Drop-down list "Option Hysteresis"	No
OPTSHAPEGRWLEVS	Options for shape type of ground water level for the Cauchy lower boundary condition	Form "Lower Boundary Conditions", Tab "Cauchy", Drop-down list "Shape type of groundwater level"	No
Irrigation and tillage			
IRRIGATIONS	Irrigation events	Form Irrigation Schemes, Box "Irrigations"	User
IRRIGATIONSCHEMES	Irrigation schemes	Form Irrigation Schemes, Box "Browse Irrigation Schemes""	User
IRRIGATIONTYPES	Types of irrigation	Form "Irrigation Schemes", Box "Edit Irrigation Scheme"	No
TILLAGESABSOLUTE	Absolute tillage events	Form "Tillage Schemes", Boxes "Browse Tillages Absolute", Tab "Edit Absolute Tillages"	User
TILLAGESCHEMES	Tillage schemes	Form "Tillage Schemes", Boxes "Browse Tillage Schemes", "Edit Tillage Scheme"	User
TILLAGESRELATIVE	Relative tillage events	Form "Tillage Schemes", Boxes "Browse Tillages Relative", Tab "Edit Relative Tillages"	User
Location and soil profile			
DEPTHDEPENDENTSUBSTPROPERTIES	Non-default factors influencing substance processes for soil horizons	Form "Soil Profiles", Box "Non Default Factors for Depth Effect" Form "Depth Dependent Substance Properties"	User
LOCATIONS	Locations	Form "Locations"	User
OPTRHOS	Options for bulk density	Form "Soil Profiles", Box "Edit Soil Profile", Drop-down list "Bulk density option"	No
SOILBUILDINGBLOCKS	Soil building blocks	Form "Soil Building Blocks"	User
SOILPROFILES	Soil profiles	Form "Soil Profiles", Boxes "Browse Soil Profiles", "Edit Soil Profile"	User
SOILPROFILESXSOILBUILDINGBLOCKS	Soil horizons	Form "Soil Profiles", Boxes "Browse Horizons in Soil Profiles", "Edit Horizon in Soil", "Non Default Factors for Depth Effect", "Default Factors for the Effect of Depth"	User
SOILTORTCURRIE	Parameters for the Currie function for the relative diffusion coefficient (tortuosity)	Form "Relative Diffusion Coefficient", Tab "Currie"	User
SOILTORTMILLQUIRK	Parameters for the Millington and Quirk function for the relative diffusion coefficient (tortuosity)	Form "Relative Diffusion Coefficient", Tab "Millington"	User
SOILTORTTROEH	Parameters for the Troeh function for the relative diffusion coefficient (tortuosity)	Form "Relative Diffusion Coefficient", Tab "Troeh"	User
TORTNAMES	Options for functions for the relative diffusion coefficient (tortuosity)	Form "Relative Diffusion Coefficient", Tab "Troeh"	No
Meteorology			
EVAPORATIONOPTIONS	Options for calculating evaporation	Form "Meteo Stations", Box "Edit Meteo Station"	No
METEODATA	Daily meteorological data	Form "Meteo Data"	User
METEODATA_HOURLY	Hourly meteorological data	Form "Meteo Data" (hourly version)	User
METEOSTATIONS	Meteorological stations	Form "Meteo Stations" Form "Locations", Box "Edit Location", Drop-down list "Meteo Station"	User
Output and graphs			
FOCUSSETFILES	XY job file contents for the predefined summary graphs	Form "Predefined graphs"	No
OPTDATEFORMATS	Options for the format date column in the output file	Form "FOCUSPEARL 5.5.5", Box "Edit Run", Tab "Output Control", Drop-down list "Format of time column in output file"	No

Name	Description	Related GUI elements	Modifiable
OPTDELTIMPRNS	Options for print method	Form "FOCUSPEARL 5.5.5", Box "Edit Run", Tab "Output Control", Drop-down list "Print method:"	No
OPTOUTPUTDEPTHTYPECODES	Options regarding output depths	Form "Detailed Output Options", Box "Variable available for output in run", Drop-down list "Depths:"	No
RUNPRINTCATEGORIES	Possible categories of variables for output	Form "Detailed Output Options", Box " Categories of variables for output"	No
RUNPRINTOUTPUTDEPTHS	Depth levels for which output of the depth-dependent variables should be written	Form "Detailed Output Options", Box "Depths"	User
RUNPRINTVARIABLES	Specifies which output variables should be written for the runs	Form "Detailed Output Options", Box "Variables available for output in run"	User
RUNPRINTVARIABLESDICTIONARY	Available output variables	Form "Detailed Output Options", Box "Variables available for output in run"	No
RUNPRINTVERTPROFDATES	Dates for which vertical profile of the selected variables should be written	Form "Detailed Output Options", Box "Variables available for output in run" (only for category "Pearl Vertical Profiles")	User
XYGRAPHTEMPLATES	Templates for user-defined graphs	Form "Graph Templates" Form "Use Template With Graph"	User
	Runs		
OPTEXPOSURETYPES	Options for exposure types	Form "FOCUSPEARL 5.5.5", Box "Edit Run", Tab "Exposure Control", Drop-down list "Exposure type:"	No
OPTSYS	Possible options regarding the system that should be simulated by PEARL	Main from, Box "Edit run", Tab "Exposure control", Drop-down list "System option"	No
PROJECTLAST	Last opened project		Appl.
PROJECTS	FOCUSPEARL projects	Form "Projects"	User
RUNS	FOCUSPEARL runs	Form "FOCUSPEARL 5.5.5"	User
	Wizard		
FOCUSCROPSXLOCATIONS	Information on crops for the various FOCUS locations	Form "FOCUS wizard for groundwater run creation...", List box "Available Crops:"	No
FOCUSIRRIGATIONSCHEMES	Predefined irrigation schemes for FOCUS location–crop combinations		No
FOCUSOPTDELTIMEVT	Default option for the repeat interval for the application scheme in wizard	Form "FOCUS wizard for groundwater run creation...", Drop-down list "Repeat interval for years:"	No
FOCUSOPTDELTIMEVTS	Options for the repeat interval for the application scheme	Form "FOCUS wizard for groundwater run creation...", Drop-down list "Repeat interval for years:"	No
FOCUSSUBSTANCE	Default substance in wizard	Form "FOCUS wizard for groundwater run creation...", Drop-down list "Substance:"	No
PERSAMCROPSSPECIFICATION	Translation table for PERSAM crops to PEARL crops	Translation table for PERSAM crops to PEARL crops	No
PERSAMSCAFACOMOVERRIDES	Scaling factors overrides	Scaling factors for soil organic matter content in the PERSAM scenario	No
	Miscellaneous		
DATETIMECOUNTING	Lists selectable dates in a year	Form "Lower Boundary Conditions", Tabs "Sine function" and "Cauchy"; Form "Crop Calendar", Box "Edit Crop in Crop Calendar"	No
SYSDBINFO	General information about the database		No
SYSTABLES	Highest IDs and ID column name(s) of every table in the database		No

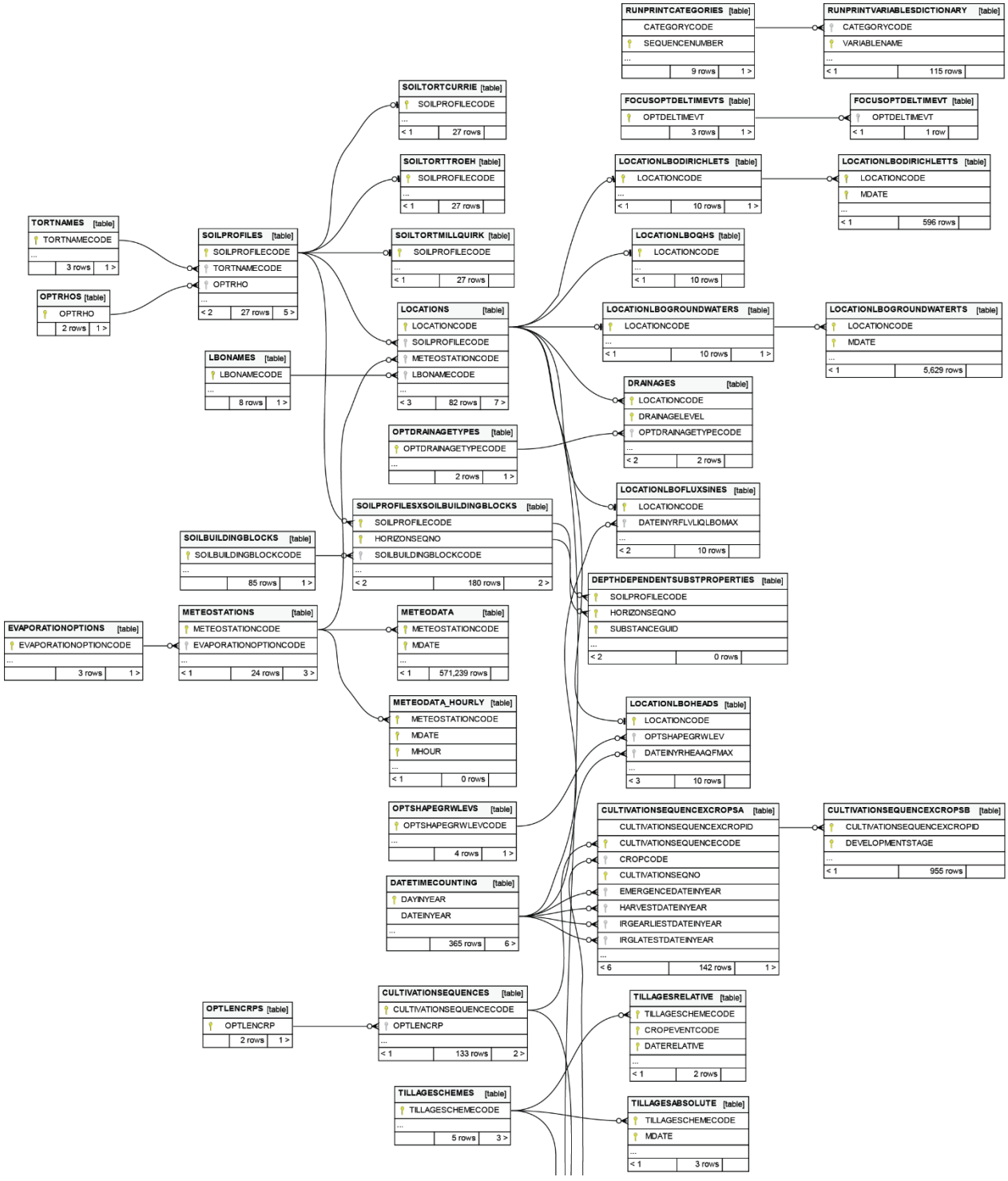

Figure 3.2 *Diagram displaying the relationships between tables in the FOCUSPEARL database—part 1. The boxes list the primary key and foreign key attributes, indicated by green and grey key symbols, respectively. In the lower left and right corners, the number of parent and child tables are indicated, respectively. Generated with SchemaSpy 6.1.1 (SchemaSpy Team, 2022).*

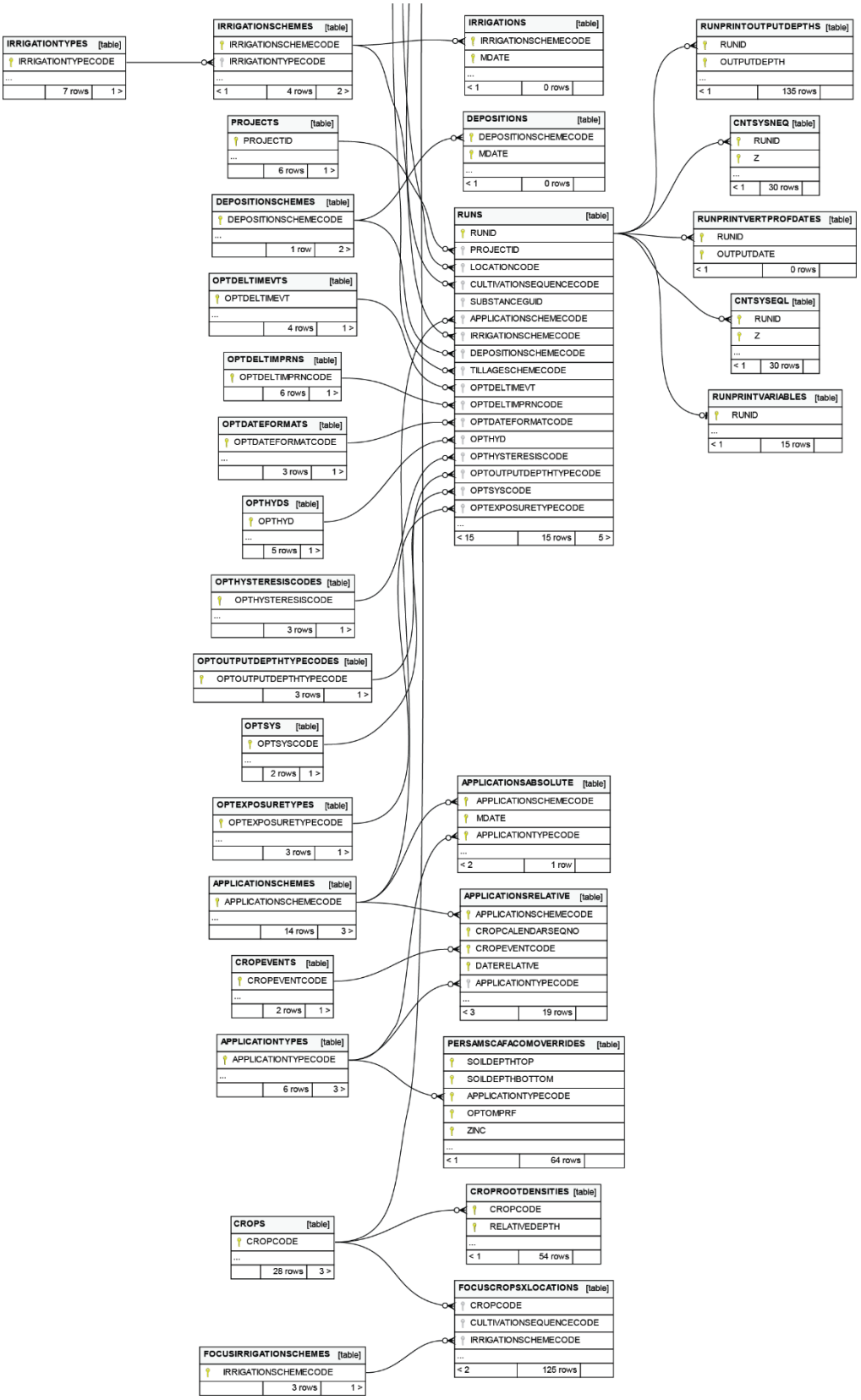

Figure 3.3 *Diagram displaying the relationships between tables in the FOCUSPEARL database—part 2. Generated with SchemaSpy 6.1.1 (SchemaSpy Team, 2022).*

References

European Commission, 2014. Assessing Potential for Movement of Active Substances and their Metabolites to Ground Water in the EU (FOCUS Ground Water Work Group No. Sanco/13144/2010).

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Justification

WOt-technical report: 230
BAPS-project number: WOT-04-008-024

This document describes the design and structure of the database and interface of FOCUSPEARL 5.5.5. The report has been reviewed and approved by Ir J.A. te Roller. We are indebted to him for reviewing an earlier version of this report and providing helpful comments to improve the text.

This project is part of the WOt theme 'Agromilieu' with theme leader Erwin van Boekel (WOt Natuur & Milieu). The project is funded by the Ministry of Agriculture, Nature and Food Quality (project number: WOT-04-008-024; contact person: Eelco Riemens).

Approved by External contact person

position: beleidsmedewerker LNV

name: Eelco Riemens

date: 12 December 2022

Approved by Internal contact person

name: Erwin van Boekel

date: 9 December 2022

Annex 1 Specification of the database tables

A specification of all 74 tables in the FOCUSPEARL database is provided below. For each table, the attributes (columns) and their data types are listed. Attributes with data types followed by "NOT NULL" are not allowed to be empty. The attribute(s) representing the primary key are set in italics.

Application, deposition and initial conditions

APPLICATIONSCHEMES

APPLICATIONSCHEMECODE	Varchar(50) NOT NULL
DESCRIPTION	Varchar(50) NOT NULL
LOCKED	Varchar(3) NOT NULL
COMMENTS	Varchar(250)

APPLICATIONSABSOLUTE

APPLICATIONSCHEMECODE	Varchar(50) NOT NULL
MDATE	Timestamp NOT NULL
APPLICATIONTYPECODE	Varchar(50) NOT NULL
DOSAGE	Double precision NOT NULL
APPLICATIONPARAMETER	Double precision NOT NULL
COMMENTS	Varchar(250)
APPLICATIONPARAMETER2	Double precision

APPLICATIONSRELATIVE

APPLICATIONSCHEMECODE	Varchar(50) NOT NULL
CROPCALENDARSEQNO	Integer NOT NULL
CROPEVENTCODE	Varchar(50) NOT NULL
DATERELATIVE	Integer NOT NULL
APPLICATIONTYPECODE	Varchar(50) NOT NULL
DOSAGE	Double precision NOT NULL
APPLICATIONPARAMETER	Double precision NOT NULL
COMMENTS	Varchar(250)
APPLICATIONPARAMETER2	Double precision

APPLICATIONTYPES

APPLICATIONTYPECODE	Varchar(50) NOT NULL
NAME	Varchar(255) NOT NULL
LOCKED	Varchar(3) NOT NULL
COMMENTS	Varchar(250)

CNTSYSEQL

RUNID	Integer NOT NULL
Z	Double precision NOT NULL
CNTSYSEQL	Double precision NOT NULL
COMMENTS	Varchar(250)

CNTSYSNEQ

RUNID	Integer NOT NULL
Z	Double precision NOT NULL

CNTSYSNEQ	Double precision NOT NULL
COMMENTS	Varchar(250)

CROPEVENTS

CROPEVENTCODE	Varchar(50) NOT NULL
NAME	Varchar(50) NOT NULL

DEPOSITIONS

DEPOSITIONSCHEMECODE	Varchar(50) NOT NULL
MDATE	Timestamp NOT NULL
FLMDEP	Double precision NOT NULL

DEPOSITIONSCHEMES

DEPOSITIONSCHEMECODE	Varchar(50) NOT NULL
DESCRIPTION	Varchar(250) NOT NULL
LOCKED	Varchar(3) NOT NULL
COMMENTS	Varchar(250)

OPTDELTIMEVTS

OPTDELTIMEVT	Varchar(50) NOT NULL
TIMSTART_LEACHING	Timestamp
TIMEND_LEACHING	Timestamp
TIMSTART_SOIL_EXPOSURE	Timestamp
TIMEND_SOIL_EXPOSURE	Timestamp

Crops

CROPROOTDENSITIES

CROPCODE	Varchar(50) NOT NULL
RELATIVEDEPTH	Double precision NOT NULL
ROOTDENSITY	Double precision NOT NULL
COMMENTS	Varchar(250)

CROPS

CROPCODE	Varchar(50) NOT NULL
NAME	Varchar(50) NOT NULL
HLIM1	Double precision NOT NULL
HLIM2	Double precision NOT NULL
HLIM3U	Double precision NOT NULL
HLIM3L	Double precision NOT NULL
HLIM4	Double precision NOT NULL
TEMSUMEMGANT	Double precision
TEMSUMANTMAT	Double precision
TEMSUMSTA	Double precision
COFEXTRAD	Double precision NOT NULL
COFEXTDIR	Double precision NOT NULL
COFINTCRP	Double precision NOT NULL
RSTEVPCRP	Double precision NOT NULL
ZTENSIOMETER	Double precision NOT NULL
FRACOVSTM	Double precision NOT NULL
WIZARDSELECTED	Integer NOT NULL
LOCKED	Varchar(3) NOT NULL
COMMENTS	Varchar(250)

CULTIVATIONSEQUENCES

CULTIVATIONSEQUENCECODE	Varchar(50) NOT NULL
NAME	Varchar(50) NOT NULL
OPTLENCRP	Varchar(50) NOT NULL
LOCKED	Varchar(3) NOT NULL
REPEATCROPS	Varchar(3) NOT NULL
COMMENTS	Varchar(250)

CULTIVATIONSEQUENCEXCROPSA

CULTIVATIONSEQUENCEXCROPID	Integer NOT NULL
CULTIVATIONSEQUENCECODE	Varchar(50) NOT NULL
CROPCODE	Varchar(50) NOT NULL
CULTIVATIONSEQNO	Integer NOT NULL
EMERGENCEDATEINYEAR	Varchar(50) NOT NULL
EMERGENCEYEAROFFSET	Integer NOT NULL
HARVESTDATEINYEAR	Varchar(50) NOT NULL
HARVESTYEAROFFSET	Integer NOT NULL
LOCKED	Varchar(3) NOT NULL
COMMENTS	Varchar(250)
IRGEARLIESTDATEINYEAR	Varchar(50) NOT NULL
IRGEARLIESTYEAROFFSET	Integer NOT NULL
IRGLATESTDATEINYEAR	Varchar(50) NOT NULL
IRGLATESTYEAROFFSET	Integer NOT NULL
PREHEAIRRSTA	Double precision NOT NULL
IRGTHRESHOLD	Double precision NOT NULL

CULTIVATIONSEQUENCEXCROPSB

CULTIVATIONSEQUENCEXCROPID	Integer NOT NULL
DEVELOPMENTSTAGE	Double precision NOT NULL
LAI	Double precision NOT NULL
FACCRP	Double precision NOT NULL
ZROOT	Double precision NOT NULL
HEIGHTCRP	Double precision
COMMENTS	Varchar(250)

OPTLENCRPS

OPTLENCRP	Varchar(50) NOT NULL

Hydrology

DRAINAGES

LOCATIONCODE	Varchar(50) NOT NULL
DRAINAGELEVEL	Integer NOT NULL
RSTDRA	Double precision NOT NULL
DISTDRA	Double precision NOT NULL
RSTINF	Double precision NOT NULL
ZDRA	Double precision NOT NULL
ZSURWAT	Double precision NOT NULL
OPTDRAINAGETYPECODE	Varchar(50) NOT NULL

LBONAMES

LBONAMECODE	Varchar(50) NOT NULL
DESCRIPTION	Varchar(255) NOT NULL

LOCKED	Varchar(3) NOT NULL
COMMENTS	Varchar(250)

LOCATIONLBODIRICHLETS

LOCATIONCODE	Varchar(50) NOT NULL
LOCKED	Varchar(3) NOT NULL
COMMENTS	Varchar(250)

LOCATIONLBODIRICHLETTS

LOCATIONCODE	Varchar(50) NOT NULL
MDATE	Timestamp NOT NULL
MVALUE	Double precision NOT NULL
COMMENTS	Varchar(250)

LOCATIONLBOFLUXSINES

LOCATIONCODE	Varchar(50) NOT NULL
FLVLIQLBOAVG	Double precision NOT NULL
FLVLIQLBOAMP	Double precision NOT NULL
DATEINYRFLVLIQLBOMAX	Varchar(50) NOT NULL
LOCKED	Varchar(3) NOT NULL
COMMENTS	Varchar(250)

LOCATIONLBOGROUNDWATERS

LOCATIONCODE	Varchar(50) NOT NULL
LOCKED	Varchar(3) NOT NULL
COMMENTS	Varchar(250)

LOCATIONLBOGROUNDWATERTS

LOCATIONCODE	Varchar(50) NOT NULL
MDATE	Timestamp NOT NULL
GRWLEV	Double precision NOT NULL
COMMENTS	Varchar(250)

LOCATIONLBOHEADS

LOCATIONCODE	Varchar(50) NOT NULL
OPTSHAPEGRWLEV	Varchar(50) NOT NULL
HEADRABASE	Double precision NOT NULL
RSTAQT	Double precision NOT NULL
HEAAQFAVG	Double precision NOT NULL
HEAAQFAMP	Double precision NOT NULL
DATEINYRHEAAQFMAX	Varchar(50) NOT NULL
LOCKED	Varchar(3) NOT NULL
COMMENTS	Varchar(250)

LOCATIONLBOQHS

LOCATIONCODE	Varchar(50) NOT NULL
COFFNCGRWLEV	Double precision NOT NULL
EXPFNCGRWLEV	Double precision NOT NULL
LOCKED	Varchar(3) NOT NULL
COMMENTS	Varchar(250)

OPTDRAINAGETYPES

OPTDRAINAGETYPECODE	Varchar(50) NOT NULL
NAME	Varchar(50) NOT NULL

OPTHYDS

OPTHYD	Varchar(50) NOT NULL
DESCRIPTION	Varchar(255) NOT NULL

OPTHYSTERESISCODES

OPTHYSTERESISCODE	Varchar(50) NOT NULL
DESCRIPTION	Varchar(50) NOT NULL

OPTSHAPEGRWLEVS

OPTSHAPEGRWLEVCODE	Varchar(50) NOT NULL
NAME	Varchar(50) NOT NULL

Irrigation and tillage

IRRIGATIONS

IRRIGATIONSCHEMECODE	Varchar(50) NOT NULL
MDATE	Timestamp NOT NULL
AMOUNT	Double precision NOT NULL
COMMENTS	Varchar(250)

IRRIGATIONSCHEMES

IRRIGATIONSCHEMECODE	Varchar(50) NOT NULL
IRRIGATIONTYPECODE	Varchar(50) NOT NULL
DESCRIPTION	Varchar(255) NOT NULL
LOCKED	Varchar(3) NOT NULL
COMMENTS	Varchar(250)

IRRIGATIONTYPES

IRRIGATIONTYPECODE	Varchar(50) NOT NULL
NAME	Varchar(255) NOT NULL
LOCKED	Varchar(3) NOT NULL
COMMENTS	Varchar(250)

TILLAGESCHEMES

TILLAGESCHEMECODE	Varchar(50) NOT NULL
DESCRIPTION	Varchar(250) NOT NULL
LOCKED	Varchar(3) NOT NULL
COMMENTS	Varchar(250)

TILLAGESABSOLUTE

TILLAGESCHEMECODE	Varchar(50) NOT NULL
DEPTH	Double precision NOT NULL
MDATE	Timestamp NOT NULL
COMMENTS	Varchar(250)

TILLAGESRELATIVE

TILLAGESCHEMECODE	Varchar(50) NOT NULL
DEPTH	Double precision NOT NULL
CROPEVENTCODE	Varchar(50) NOT NULL
DATERELATIVE	Integer NOT NULL
COMMENTS	Varchar(250)

Location and soil profile

DEPTHDEPENDENTSUBSTPROPERTIES

SOILPROFILECODE	Varchar(50) NOT NULL
HORIZONSEQNO	Integer NOT NULL
SUBSTANCEGUID	Varchar(38) NOT NULL
FACZTRA	Double precision NOT NULL
FACZSOR	Double precision NOT NULL

LOCATIONS

LOCATIONCODE	Varchar(50) NOT NULL
NAME	Varchar(50) NOT NULL
COUNTRY	Varchar(50)
LONGITUDE	Double precision
LATITUDE	Double precision
ALTITUDE	Double precision
SOILPROFILECODE	Varchar(50) NOT NULL
METEOSTATIONCODE	Varchar(31) NOT NULL
ZPNDMAX	Double precision NOT NULL
TEMLBOSTA	Double precision NOT NULL
THIAIRBOULAY	Double precision NOT NULL
CREATIONDATE	Timestamp NOT NULL
MODIFICATIONDATE	Timestamp NOT NULL
LBONAMECODE	Varchar(50) NOT NULL
FOCUSZGRWLEVSTA	Double precision NOT NULL
WIZARDSELECTED	Integer NOT NULL
LOCKED	Varchar(3) NOT NULL
OPTDRA	Varchar(3) NOT NULL
COMMENTS	Varchar(250)
LOCATIONTYPE	Varchar(5)

OPTRHOS

OPTRHO	Varchar(50) NOT NULL

SOILBUILDINGBLOCKS

SOILBUILDINGBLOCKCODE	Varchar(50) NOT NULL
FRASAND	Double precision NOT NULL
FRASILT	Double precision NOT NULL
FRACLAY	Double precision NOT NULL
CNTOM	Double precision
PH	Double precision
THETASAT	Double precision NOT NULL
THETARES	Double precision NOT NULL
ALPHA	Double precision NOT NULL
ALPHAWET	Double precision NOT NULL
N	Double precision NOT NULL
KSAT	Double precision NOT NULL
L	Double precision NOT NULL
RHO	Double precision NOT NULL
LOCKED	Varchar(3) NOT NULL
COMMENTS	Varchar(250)

SOILPROFILES

SOILPROFILECODE	Varchar(50) NOT NULL

NAME	Varchar(50) NOT NULL
FACEVPSOL	Double precision NOT NULL
COFREDEVP	Double precision NOT NULL
TORTNAMECODE	Varchar(50) NOT NULL
OPTRHO	Varchar(50) NOT NULL
LOCKED	Varchar(3) NOT NULL
COMMENTS	Varchar(250)

SOILPROFILESXSOILBUILDINGBLOCKS

SOILPROFILECODE	Varchar(50) NOT NULL
HORIZONSEQNO	Integer NOT NULL
SOILBUILDINGBLOCKCODE	Varchar(50) NOT NULL
THICKNESS	Double precision NOT NULL
COMPARTMENTCNT	Integer NOT NULL
LENDISLIQ	Double precision NOT NULL
FACZTRA	Double precision NOT NULL
FACZSOR	Double precision NOT NULL
SCAFACOM	Double precision NOT NULL
COMMENTS	Varchar(250)

SOILTORTCURRIE

SOILPROFILECODE	Varchar(50) NOT NULL
COFDIFGASCUR	Double precision NOT NULL
EXPDIFGASCUR	Double precision NOT NULL
COFDIFLIQCUR	Double precision NOT NULL
EXPDIFLIQCUR	Double precision NOT NULL

SOILTORTMILLQUIRK

SOILPROFILECODE	Varchar(50) NOT NULL
EXPDIFLIQMILNOM	Double precision NOT NULL
EXPDIFLIQMILDEN	Double precision NOT NULL
EXPDIFGASMILNOM	Double precision NOT NULL
EXPDIFGASMILDEN	Double precision NOT NULL

SOILTORTTROEH

SOILPROFILECODE	Varchar(50) NOT NULL
COFDIFGASTRO	Double precision NOT NULL
EXPDIFGASTRO	Double precision NOT NULL
COFDIFLIQTRO	Double precision NOT NULL
EXPDIFLIQTRO	Double precision NOT NULL

TORTNAMES

TORTNAMECODE	Varchar(50) NOT NULL
DESCRIPTION	Varchar(255) NOT NULL
COMMENTS	Varchar(250)

EVAPORATIONOPTIONS

EVAPORATIONOPTIONCODE	Varchar(50) NOT NULL
DESCRIPTION	Varchar(50) NOT NULL

Meteorology

METEODATA

METEOSTATIONCODE	Varchar(31) NOT NULL
MDATE	Timestamp NOT NULL
RDD	Double precision NOT NULL
TMMN	Double precision NOT NULL
TMMX	Double precision NOT NULL
VP	Double precision NOT NULL
WN	Double precision NOT NULL
RAIN	Double precision NOT NULL
ETREF	Double precision NOT NULL

METEODATA_HOURLY

METEOSTATIONCODE	Varchar(31) NOT NULL
MDATE	Timestamp NOT NULL
MHOUR	Integer NOT NULL
RADINT	Double precision NOT NULL
TEMAIR	Double precision NOT NULL
TEMAIRLOW	Double precision NOT NULL
HUM	Double precision NOT NULL
RATWND	Double precision NOT NULL
RAININT	Double precision NOT NULL
EVPREF	Double precision NOT NULL

METEOSTATIONS

METEOSTATIONCODE	Varchar(31) NOT NULL
NAME	Varchar(50) NOT NULL
COUNTRY	Varchar(50) NOT NULL
LONGITUDE	Double precision NOT NULL
LATITUDE	Double precision NOT NULL
ALTITUDE	Double precision NOT NULL
EVAPORATIONOPTIONCODE	Varchar(50) NOT NULL
LOCKED	Varchar(3) NOT NULL
COMMENTS	Varchar(250)
FOCUS_ANNUALTEM	Double precision
FOCUS_ANNUALPRC	Double precision

Output and graphs

FOCUSSETFILES

FOCUSSETFILENAME	Varchar(250) NOT NULL
FILETEXT	Varchar(32765)

OPTDATEFORMATS

OPTDATEFORMATCODE	Varchar(50) NOT NULL
DESCRIPTION	Varchar(50) NOT NULL
X_AS_LABEL	Varchar(50)

OPTDELTIMPRNS

OPTDELTIMPRNCODE	Varchar(50) NOT NULL

OPTOUTPUTDEPTHTYPECODES

OPTOUTPUTDEPTHTYPECODE	Varchar(50) NOT NULL

RUNPRINTCATEGORIES

CATEGORYCODE	Varchar(250) NOT NULL
DESCRIPTION	Varchar(255) NOT NULL
SEQUENCENUMBER	Double precision NOT NULL

RUNPRINTOUTPUTDEPTHS

RUNID	Integer NOT NULL
OUTPUTDEPTH	Double precision NOT NULL
COMMENTS	Varchar(250)

RUNPRINTVARIABLES

RUNID	Integer NOT NULL
AMAAPPCRP	Varchar(3) NOT NULL
AMAAPPSOL	Varchar(3) NOT NULL
AMACRP	Varchar(3) NOT NULL
AMADRA_1	Varchar(3) NOT NULL
AMADRA_2	Varchar(3) NOT NULL
AMADRA_3	Varchar(3) NOT NULL
AMADRA_4	Varchar(3) NOT NULL
AMADRA_5	Varchar(3) NOT NULL
AMAEQLTGT	Varchar(3) NOT NULL
AMAEQLPRO	Varchar(3) NOT NULL
AMAEQLTIL	Varchar(3) NOT NULL
AMAERRMIC	Varchar(3) NOT NULL
AMAFORPRO	Varchar(3) NOT NULL
AMAHARCRP	Varchar(3) NOT NULL
AMANEQTGT	Varchar(3) NOT NULL
AMANEQPRO	Varchar(3) NOT NULL
AMANEQTIL	Varchar(3) NOT NULL
AMASYSTGT	Varchar(3) NOT NULL
AMASYSPRO	Varchar(3) NOT NULL
AMASYSTIL	Varchar(3) NOT NULL
AMATRAPRO	Varchar(3) NOT NULL
AMAUPTPRO	Varchar(3) NOT NULL
AMADSPCRP	Varchar(3) NOT NULL
AMAWASCRP	Varchar(3) NOT NULL
CONGAS	Varchar(3) NOT NULL
CONLIQ	Varchar(3) NOT NULL
CONLIQLBO	Varchar(3) NOT NULL
CONLIQSATAVG	Varchar(3) NOT NULL
CONSYS	Varchar(3) NOT NULL
CONSYSEQL	Varchar(3) NOT NULL
CONSYSNEQ	Varchar(3) NOT NULL
DELTIMPRL	Varchar(3) NOT NULL
EPS	Varchar(3) NOT NULL
FACCRPEVP	Varchar(3) NOT NULL
FLMDEPCRP	Varchar(3) NOT NULL
FLMGAS	Varchar(3) NOT NULL
FLMGASVOL	Varchar(3) NOT NULL
FLMLIQ	Varchar(3) NOT NULL
FLMLIQINFSYS	Varchar(3) NOT NULL

FLMLIQLBO	Varchar(3) NOT NULL
FLMSYS	Varchar(3) NOT NULL
FLVLIQ	Varchar(3) NOT NULL
FLVLIQDRA_3	Varchar(3) NOT NULL
FLVLIQDRA_4	Varchar(3) NOT NULL
FLVLIQDRA_5	Varchar(3) NOT NULL
FLVLIQEVPINTIRR	Varchar(3) NOT NULL
FLVLIQEVPINTPRC	Varchar(3) NOT NULL
FLVLIQEVPSOL	Varchar(3) NOT NULL
FLVLIQEVPSOLPOT	Varchar(3) NOT NULL
FLVLIQIRR	Varchar(3) NOT NULL
FLVLIQLBO	Varchar(3) NOT NULL
FLVLIQGRW	Varchar(3) NOT NULL
FLVLIQTRP	Varchar(3) NOT NULL
FLVLIQTRPPOT	Varchar(3) NOT NULL
FRACOVCRP	Varchar(3) NOT NULL
GRWLEV	Varchar(3) NOT NULL
LAI	Varchar(3) NOT NULL
PREHEA	Varchar(3) NOT NULL
THETA	Varchar(3) NOT NULL
STOCAP	Varchar(3) NOT NULL
VVRLIQDRA	Varchar(3) NOT NULL
VVRLIQUPT	Varchar(3) NOT NULL
ZROOT	Varchar(3) NOT NULL
FLVLIQDRA_1	Varchar(3) NOT NULL
FLVLIQDRA_2	Varchar(3) NOT NULL
FLVLIQPRC	Varchar(3) NOT NULL
TEM	Varchar(3) NOT NULL
CONLIQDRA_1	Varchar(3) NOT NULL
CONLIQDRA_2	Varchar(3) NOT NULL
CONLIQDRA_3	Varchar(3) NOT NULL
CONLIQDRA_4	Varchar(3) NOT NULL
CONLIQDRA_5	Varchar(3) NOT NULL
CONLIQDRA	Varchar(3) NOT NULL
ZPND	Varchar(3) NOT NULL
AVOLIQSOL	Varchar(3) NOT NULL
CONGAS_VPRF	Varchar(3) NOT NULL
CONLIQ_VPRF	Varchar(3) NOT NULL
CONSYS_VPRF	Varchar(3) NOT NULL
CONSYSEQL_VPRF	Varchar(3) NOT NULL
CONSYSNEQ_VPRF	Varchar(3) NOT NULL
PREHEA_VPRF	Varchar(3) NOT NULL
TEM_VPRF	Varchar(3) NOT NULL
THETA_VPRF	Varchar(3) NOT NULL
AVOLIQERR	Varchar(3) NOT NULL
FLVLIQINF	Varchar(3) NOT NULL
RSTAIRLAM	Varchar(3) NOT NULL
AMARUNOFF	Varchar(3) NOT NULL
AMASOLSUR	Varchar(3) NOT NULL
VELWND	Varchar(3) NOT NULL
TEMAIR	Varchar(3) NOT NULL
FLVLIQCANDRP	Varchar(3) NOT NULL
CONLIQPER	Varchar(3) NOT NULL
CNTSYSPER	Varchar(3) NOT NULL

CONLIQTWA2D	Varchar(3) NOT NULL
CONLIQTWA3D	Varchar(3) NOT NULL
CONLIQTWA4D	Varchar(3) NOT NULL
CNTSYSTWA2D	Varchar(3) NOT NULL
CNTSYSTWA3D	Varchar(3) NOT NULL
CNTSYSTWA4D	Varchar(3) NOT NULL
CONLIQTWA1D	Varchar(3) NOT NULL
CNTSYSTWA1D	Varchar(3) NOT NULL

RUNPRINTVARIABLESDICTIONARY

CATEGORYCODE	Varchar(250) NOT NULL
VARIABLENAME	Varchar(250) NOT NULL
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UNITXYNORMAL	Varchar(255) NOT NULL
UNITGUINORMAL	Varchar(255) NOT NULL
UNITXYCUMULATIVE	Varchar(255) NOT NULL
UNITGUICUMULATIVE	Varchar(255) NOT NULL
DESCRIPTIONCUMULATIVE	Varchar(255) NOT NULL
BASICTODISPLAYUNITCONVERSION	Double precision NOT NULL
SELECTEDFORGRAPH	Varchar(50)
SELECTEDFORPRINT	Varchar(50)
DEFAULTVALUE	Varchar(3) NOT NULL
HASDEPTH	Varchar(3) NOT NULL
ISCOMPOUND	Varchar(3) NOT NULL
ISTOXSWAVARIABLE	Varchar(3) NOT NULL
ISVERTPROFVARIABLE	Varchar(3) NOT NULL

RUNPRINTVERTPROFDATES

RUNID	Integer NOT NULL
OUTPUTDATE	Timestamp NOT NULL

XYGRAPHTEMPLATES

GRAPHTEMPLATECODE	Varchar(50) NOT NULL
NAME	Varchar(50) NOT NULL
XMIN	Double precision NOT NULL
XMAX	Double precision NOT NULL
Y1MIN	Double precision NOT NULL
Y1MAX	Double precision NOT NULL
FREETEXT	Varchar(32765)
XUSE	Varchar(3) NOT NULL
YUSE	Varchar(3) NOT NULL
XMAJORDIV	Double precision
XMINORDIV	Double precision
Y1MAJORDIV	Double precision
Y1MINORDIV	Double precision

Runs

OPTEXPOSURETYPES

OPTEXPOSURETYPECODE	Varchar(50) NOT NULL
DESCRIPTION	Varchar(255) NOT NULL

OPTSYS

OPTSYSCODE	Varchar(31) NOT NULL
DESCRIPTION	Varchar(255) NOT NULL

PROJECTLAST

PROJECTID	Integer NOT NULL

PROJECTS

PROJECTID	Integer NOT NULL
DESCRIPTION	Varchar(255) NOT NULL
CREATIONDATE	Timestamp NOT NULL
MODIFICATIONDATE	Timestamp NOT NULL
LOCKED	Varchar(3) NOT NULL
COMMENTS	Varchar(250)

RUNS

RUNID	Integer NOT NULL
PROJECTID	Integer NOT NULL
NAME	Varchar(255) NOT NULL
CHANGEDETECTION	Varchar(50) NOT NULL
SELECTEDFOREXECUTION	Varchar(50)
LOCATIONCODE	Varchar(50) NOT NULL
CULTIVATIONSEQUENCECODE	Varchar(50) NOT NULL
SUBSTANCEGUID	Varchar(38) NOT NULL
APPLICATIONSCHEMECODE	Varchar(50) NOT NULL
IRRIGATIONSCHEMECODE	Varchar(50) NOT NULL
DEPOSITIONSCHEMECODE	Varchar(50) NOT NULL
TILLAGESCHEMECODE	Varchar(50) NOT NULL
TIMSTART	Timestamp NOT NULL
TIMEND	Timestamp NOT NULL
RESULTSDETAILED	Varchar(50) NOT NULL
RESULTSSUMMARY	Varchar(50) NOT NULL
OPTDELTIMEVT	Varchar(50) NOT NULL
OPTDELTIMPRNCODE	Varchar(50) NOT NULL
DELTIMPRN	Integer NOT NULL
DELTIMSWAMIN	Double precision NOT NULL
DELTIMSWAMAX	Double precision NOT NULL
THETATOL	Double precision NOT NULL
OPTDATEFORMATCODE	Varchar(50) NOT NULL
OPTHYD	Varchar(50) NOT NULL
ZGRWLEVSTA	Double precision NOT NULL
ZTGT	Double precision NOT NULL
GWLTOL	Double precision NOT NULL
MAXITSWA	Integer NOT NULL
OPTHYSTERESISCODE	Varchar(50) NOT NULL
MODELERRORTEXT	Varchar(2000)
PREHEAWETDRYMIN	Double precision NOT NULL
OPTOUTPUTDEPTHTYPECODE	Varchar(50) NOT NULL
REALFORMAT	Varchar(50) NOT NULL
CREATIONDATE	Timestamp NOT NULL
MODIFICATIONDATE	Timestamp NOT NULL
DISABLERESULTS	Varchar(3) NOT NULL
ISRESTRICTEDRUN	Varchar(3) NOT NULL
DETAILEDOUTPUT	Varchar(3) NOT NULL

PRINTCUMULATIVES	Varchar(3) NOT NULL
RESULTSREPORT	Varchar(3) NOT NULL
COMMENTS	Varchar(250)
OPTSYSCODE	Varchar(31) NOT NULL
SUBSTANCECHECKSUM	Varchar(9) NOT NULL
ZEADTOP	Double precision NOT NULL
ZEADBOT	Double precision NOT NULL
CNTOMINP	Double precision
PHINP	Double precision
DIFTEM	Double precision
FACPRC	Double precision
FACEVP	Double precision
ANNUALTEM	Double precision NOT NULL
INTPOSTAPP	Integer
OPTEXPOSURETYPECODE	Varchar(50) NOT NULL
SUBSTANCEASS	Varchar(255) NOT NULL
FREF	Double precision NOT NULL
PERSAMTYPEOFENDPOINT	Varchar(50)
PERSAMLOCATION	Varchar(50)

Wizard

FOCUSCROPSXLOCATIONS

LOCATIONCODE	Varchar(50) NOT NULL
CROPCODE	Varchar(50) NOT NULL
CULTIVATIONSEQUENCECODE	Varchar(50) NOT NULL
IRRIGATIONSCHEMECODE	Varchar(50) NOT NULL

FOCUSIRRIGATIONSCHEMES

FOCUSIRRIGATIONSCHEMES	Varchar(50) NOT NULL

FOCUSOPTDELTIMEVT

OPTDELTIMEVT	Varchar(50) NOT NULL

FOCUSOPTDELTIMEVTS

OPTDELTIMEVT	Varchar(50) NOT NULL

FOCUSSUBSTANCE

SUBSTANCEGUID	Varchar(38) NOT NULL

PERSAMCROPSSPECIFICATION

NR	Integer NOT NULL
PERSAM_CROP	Varchar(250) NOT NULL
NORTH_FOCUS_CROP	Varchar(250) NOT NULL
CENTRE_FOCUS_CROP	Varchar(250) NOT NULL
SOUTH_FOCUS_CROP	Varchar(250) NOT NULL
CAPRI_CROP	Varchar(250) NOT NULL
TYPEOFEXASS	Varchar(250) NOT NULL
OPTOMPRF	Varchar(250) NOT NULL
NORTH_MET	Varchar(31) NOT NULL
CENTRE_MET	Varchar(31) NOT NULL
SOUTH_MET	Varchar(31) NOT NULL
NORTH_CROP	Varchar(31) NOT NULL

CENTRE_CROP	Varchar(31) NOT NULL
SOUTH_CROP	Varchar(31) NOT NULL
NORTH_IRR	Varchar(31) NOT NULL
CENTRE_IRR	Varchar(31) NOT NULL
SOUTH_IRR	Varchar(31) NOT NULL

PERSAMSCAFACOMOVERRIDES

SOILDEPTHTOP	Integer NOT NULL
SOILDEPTHBOTTOM	Integer NOT NULL
APPLICATIONTYPECODE	Varchar(50) NOT NULL
OPTOMPRF	Varchar(50) NOT NULL
ZINC	Integer NOT NULL
SCAFACOM	Double precision NOT NULL

Miscellaneous

DATETIMECOUNTING

DAYINYEAR	Integer NOT NULL
DAYINMONTH	Integer NOT NULL
MONTHLONGENGLISH	Varchar(255) NOT NULL
MONTHSHORTENGLISH	Varchar(3) NOT NULL
MONTHNUMBER	Integer NOT NULL
WEEKINYEAR	Integer NOT NULL
DECADEINMONTHNUMBER	Integer NOT NULL
DATEINYEAR	Varchar(50) NOT NULL

SYSDBINFO

DBVERSION	Integer NOT NULL
DBVERSIONDATA	Integer
DBNAME	Varchar(255)
EMAILSUPPORTADDRESS	Varchar(255) NOT NULL
WEBSITE	Varchar(255) NOT NULL
ACCESSED	Varchar(3) NOT NULL

SYSTABLES

TABLENAME	Varchar(31) NOT NULL
HIGHESTID	Bigint
TABLEID	Varchar(31) NOT NULL

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