

# LIMS Developers Manual

From GCPWiki

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## Instructions and Guidelines for Collaborative Development

### Use Cases

By Institute:

*(list each institute section here)*

### UML

Class Diagrams (To be followed by Sequence Diagram)

## Backbone of the LIMS Source Code Structure

### Database Schema

- Tables, Fields & Indexes
- Relations
- Views, Store Procedures and Queries

#### Tables, Fields & Indexes

##### 1- Users' Information [user\_info]:

This table handles the basic information of users; we use this information to trace users activities, manage the security system and privileges.

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
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user_id	User Login Name	varchar (255)	Yes	PRIMARY KEY
scientist	Administrator (supervisor) of current User, Linked to User ID in Users' Information [user_info] table	varchar (255)		
password	User's Password: we do not use any encryption algorithm to store user's password, it saves as clear text	varchar (255)	Yes	
access_level	Access Level: This field accepts numbers from 1-4; this is to set user access levels from Scientist(1) to technician (4)	int2		

### 2- Study Information [user\_psc]:

This table handles Projects, studies and Crop information

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
upsc_id	Study ID: Re: It's a combination of project, study, crop & user which LIMS system generates	varchar (500)	Yes	
project_name	Project Name	varchar (255)	Yes	
study_name	Study Name	varchar (255)	Yes	
crop_name	Crop Name	varchar (255)	Yes	
user_id	Link to User ID [user_id] in Users' Information [user_info] table	varchar (255)	Yes	
date_of_creation	Date of Creation: LIMS adds value of this field automatically	timestamp	Yes	
date_of_correction	Date of Correction: LIMS adds and update the value of this field automatically	timestamp		

### 3- Experiment Master [experiment\_master]:

This table handles experiments information in the studies.

Fiel	Description	Data	Requir	Inde
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<b>d nam e</b>		<b>type (&amp; Size)</b>	<b>ed (NOT NULL)</b>	<b>x</b>
expe rime nt_ nam e	Experiment name	varch ar (255)	Yes	PRI MA RY KE Y
desc ripti on	Description	varch ar (1000 )		
locat ion	Location	varch ar (255)	Yes	
year _of_ expe rime nt	Year of Experiment	int4	Yes	
no_o f_ geno type s	Number of genotypes in the cornet experiment: While creating a new experiment under STARTUP module the user will enter the no of genotypes with which he will working.	int4	Yes	
upsc _id	Link to Study ID [upsc_id] in study information [user_psc] table	varch ar (500)	Yes	
date _of_ creat ion	Date of Creation: LIMS adds value of this field automatically	timest amp	Yes	
date _of_ corr ectio n	Date of Correction: LIMS adds and update the value of this field automatically	timest amp		

#### **4- Genotype Master [genotype\_master]:**

This table handles Genotype information in experiments.

<b>Field name</b>	<b>Description</b>	<b>Data type (&amp; Size)</b>	<b>Required (NOT NULL)</b>	<b>Index</b>
lims_id	LIMS ID: is generated by LIMS system for a particular accession. It is not the accession id.	vvarchar (15)	Yes	PRIMARY KEY
genotype_id	Genotype ID Accession ID, which the user will upload.	vvarchar (100)	Yes	
experiment_name	Link to experiment name in [experiment information] table	vvarchar (255)	Yes	
upsc_id	Link to Study ID [upsc_id] in study information [user_psc] table	vvarchar (500)	Yes	
date_of_creation	Date of Creation: LIMS adds value of this field automatically	timestamp	Yes	
date_of_correction	Date of Correction: LIMS adds and update the value of this field automatically	timestamp		

#### **5- Genotype Trait Details [genotype\_traitdetails]:**

This table includes details (traits information) about the genotype (accession)

<b>Field name</b>	<b>Description</b>	<b>Data type (&amp; Size)</b>	<b>Required (NOT NULL)</b>	<b>Index</b>
lims_id	Link to lims_id in [Genotype master]	vvarchar (15)	Yes	
trait_name	Trait name	vvarchar (100)	Yes	
trait_value	Trait value	vvarchar (1000)		

#### **6- DNA Extraction Tracking [dna\_extraction\_tracking]:**

<b>Field name</b>	<b>Description</b>	<b>Data type (&amp; Size)</b>	<b>Required (NOT NULL)</b>	<b>Index</b>
dna_plate_id	DNS plate ID	vvarchar	Yes	PRIMARY

		(255)		KEY
dna_extraction_protocol	DNA extraction protocol, link to Protocol name [dna_protocols]	varchar (255)	Yes	
plate_type	Plate type (96, 16)	varchar (50)	Yes	
upsc_id	Link to Study ID [upsc_id] in study information [user_psc] table	varchar (500)	Yes	
date_of_creation	Date of Creation: LIMS adds value of this field automatically	Timestamp	Yes	
date_of_correction	Date of Correction: LIMS adds and update the value of this field automatically	Timestamp		

#### 7- DNA Protocols [dna\_protocols]:

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
protocol_name	Protocol name	varchar (255)	Yes	PRIMARY KEY
protocol_type	Protocol type (Extraction, Quantification)	varchar (50)	Yes	
manual_or_tecan	Manual Protocol or robotic system Protocol (tecan)	varchar (50)	Yes	
protocol_filename	Protocol file name	varchar (1000)	Yes	
user_id	Link to User ID [user_id] in Users' Information [user_info] table	varchar (255)	Yes	
date_of_creation	Date of creation: LIMS adds value of this field automatically	Timestamp	Yes	

#### 8- DNA Extraction Well [dna\_extraction\_well]:

This table includes the information of Plate Contents

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
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		Size)		
dna_plate_id	Link to DNA plate ID [dna_plate_id] in DNA extraction tracking [dna_extraction_tracking] table	varchar (255)	Yes	
lims_id	Link to LIMS ID [lims_id] (the Accession ID in the current experiment) in Genotype master [genotype_master] table	varchar (15)	Yes	
col_id	Column number	int2	Yes	
row_id	Row code	varchar (2)	Yes	

### 9- DNA Extraction Details [dna\_extraction\_exptdetails]:

Type and age of material in the plate

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
dna_plate_id	Link to DNA plate ID [dna_plate_id] in DNA extraction tracking [dna_extraction_tracking] table	varchar (255)	Yes	
experiment_name	Link to Experiment name [experiment_name] in experiment master [experiment_master] table	varchar (255)	Yes	
type_of_material	Type of material ()	varchar (100)	Yes	
age_of_material	Age of material (days)	varchar (50)	Yes	

### 10- DNA Extraction Plate Controls [dna\_extraction\_plate\_controls]:

This table includes the information on control samples indicated by the user in an extracted plate.

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
dna_plate_id	Link to DNA plate ID [dna_plate_id] in DNA extraction tracking [dna_extraction_tracking] table	varchar (255)	Yes	
lims_id	Link to LIMS ID [lims_id] (the Accession ID in the current experiment) in Genotype master [genotype_master] table	varchar (15)	Yes	

col_id	Column number	int2	Yes	
row_id	Row code	varchar (2)	Yes	

### 11- DNA Quantification Tracking [dna\_quantification\_tracking]:

User can select two protocols while quantifying. Protocols\_selected field contains the protocols that are selected (whether it's one or two).

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
dna_plate_id	Link to DNA plate ID [dna_plate_id] in DNA extraction tracking [dna_extraction_tracking] table	varchar (255)	Yes	
dna_quantification_set	DNA Quantification Set	varchar (10)		
protocols_selected	Protocols Selected: link to Protocol name in DNA protocols [dna_protocols] table (e.g. agarose gel electrophoresis, Fluorescence, Spectrophotometry)	varchar (255)	Yes	
dna_quantification_protocol	DNA Quantification Protocol: The protocol which the user selects. It does not link to dna_protocols table.	varchar (255)	Yes	
dilution_factor_value	Dilution Factor Value	float4		
gel_image*	Gel Image: It is meant to upload a gel image of the quantified DNA samples. *At present not in use.	varchar (255)		
upsc_id	Link to Study ID [upsc_id] in study information [user_psc] table	varchar	Yes	

		(500)		
date_of_creation	Date of creation: LIMS adds value of this field automatically	timest amp	Yes	
date_of_correction	Date of correction: LIMS adds and update the value of this field automatically	timest amp		

### 12- DNA Quantification Tracking Details [dna\_quantification\_trackingdetails]:

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
dna_quantification_set	link to DNA quantification Set [dna_quantification_set] DNA quantification tracking [dna_quantification_tracking] table	varchar (10)	Yes	
dna_plate_id	Link to DNA plate ID [dna_plate_id] in DNA extraction tracking [dna_extraction_tracking] table	varchar (255)	Yes	
col_id	Column ID	int2		
row_id	Row ID	varchar (2)		
dna_concentration	DNA Concentration	float4		
purity_ratio	Purity Ratio	float4		
Tecan background	Tecan background	float4		
ecansamples	Tecan samples	float4		

### 13- DNA Dilution [dna\_dilution]:

Field	Description	Data	Required	In
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<b>name</b>		<b>type (&amp; Size)</b>	<b>(NOT NULL)</b>	<b>de x</b>
dna_plate_id	Link to DNA plate ID [dna_plate_id] in DNA extraction tracking [dna_extraction_tracking] table	varchar (255)	Yes	
dna_quantification_set	link to DNA quantification Set [dna_quantification_set] DNA quantification tracking [dna_quantification_tracking] table	varchar (10)	Yes	
dilution_concentration	Dilution Concentration (ng/μl)	float4	Yes	
dilution_reagent	Dilution Reagent	varchar (50)		
total_volume	Total Volume (μl)	int4	Yes	
Remarks	Remarks	varchar (1000)	Yes	
upsc_id	Link to Study ID [upsc_id] in study information [user_psc] table	varchar (500)	Yes	
date_of_creation	Date of creation: LIMS adds value of this field automatically	timestamp	Yes	
date_of_correction	Date of correction: LIMS adds and update the value of this field automatically	timestamp		

#### 14- LIMS Gwl Files [lims\_gwlfiles]:

This table relates to users who use the Tecan robotics system for quantification and dilution. Sometimes the user may choose to skip the "DNAQuantification" module under "SampleTracking" in the LIMS; instead he may choose to upload the resulting file from the Tecan machine. The machine labels this file with a .gwl extension; which the user uploads through the "Upload .GWL File" sub module. This table stores the data submitted. (SampleTracking → DNADilution → Upload .gwl file)

<b>Field name</b>	<b>Description</b>	<b>Data type (&amp; Size)</b>	<b>Required (NOT NULL)</b>	<b>Index</b>
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dna_plate_id	Link to DNA plate ID [dna_plate_id] in DNA extraction tracking [dna_extraction_tracking] table	varchar (255)	Yes	
filename	File Name: gwl file name which the user will upload	varchar (255)	Yes	
dilution_factor	Dilution Factor: will be entered by user through form	float4	Yes	
date_of_normalisation	Normalization date: will be entered by user through form	timestamp	Yes	
upsc_id	Link to Study ID [upsc_id] in study information [user_psc] table	varchar (500)	Yes	

#### 15- DNA Storage [dna\_storage]:

This table deals with the "DNASStorage" module under "Sampletracking".

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
dna_plate_id	Link to DNA plate ID [dna_plate_id] in DNA extraction tracking [dna_extraction_tracking] table	varchar (255)	Yes	
lab_no	Lab number	varchar (255)	Yes	
coldroom_no	Cold room number	varchar (255)		
fridge_accession_no	Fridge acc number: Fridge Accession number	varchar (255)		
fridge_freezer_no	Fridge freezer number	varchar (255)		
type_of_compartment	Type of compartment (e.g. Upper, Lower, Left, Right)	varchar (255)		
upsc_id	Link to Study ID [upsc_id] in study information [user_psc] table	varchar (500)		

#### 16- PCR Tracking [pcr\_tracking]:

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
pcr_plate_id	PCR Plate ID	varchar (255)	Yes	PRIMARY KEY
plate_type	Plate type (e.g. 96)	varchar (50)	Yes	
upsc_id	Link to Study ID [upsc_id] in study information [user_psc] table	varchar (500)	Yes	
date_of_creation	Date of creation: LIMS adds value of this field automatically	timestamp	Yes	
date_of_correction	Date of correction: LIMS adds and update the value of this field automatically	timestamp		

#### 17- PCT Tracking Well [pcr\_tracking\_well]:

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
pcr_plate_id	Link to PCR Plate ID [pcr_plate_id] in PCR Tracking [pcr_tracking] table	varchar (255)	Yes	
lims_id	Link to LIMS ID [lims_id] (the Accession ID in the current experiment) in Genotype master [genotype_master] table	varchar (15)	Yes	
col_id	Column number	int2	Yes	
row_id	Row code	varchar (2)	Yes	

#### 18- Marker Subsets [marker\_subsets]:

Where a user will create a subset of markers which he can use later while associating markers with a PCR plate. SampleTracking → MarkerSelection → Create Marker Subsets,

Field name	Description	Range	Data type	Size
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marker_subset_name	Marker subset name (ID)	varchar (50)	Yes	
marker_name	Link to Marker Name [marker_name] to LIMS PCR Markers [lims_pcr_markers] table	varchar (255)	Yes	
electrophoresis_type	Electrophoresis type	varchar (50)	Yes	
date_of_creation	Date of creation: LIMS adds value of this field automatically	timestamp	Yes	
user_id	Link to User ID [user_id] in Users' Information [user_info] table	varchar (255)	Yes	

#### 19- LIMS Multiplex [lims\_multiplex]:

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
multiplex_id	Multiplex ID	varchar (15)	Yes	PRIMARY KEY
multiplex_name	Multiplex name	varchar (255)		
electrophoresis_type	Electrophoresis type: whether PAGE or Capillary	varchar (50)	Yes	
upsc_id	Link to Study ID [upsc_id] in study information [user_psc] table	varchar (500)	Yes	
date_of_creation	Date of creation: LIMS adds value of this field automatically	timestamp	Yes	
date_of_correction	Date of correction: LIMS adds and update the value of this field automatically	timestamp		

#### 20- LIMS Multiplex Markers [lims\_multiplex\_markers]:

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
multiplex_id	link to Multiplex ID [multiplex_id] in LIMS multiplex [lims_multiplex] table	varchar (15)	Yes	

marker_name	Link to Marker Name [marker_name] to LIMS PCR Markers [lims_pcr_markers] table	vvarchar (255)	Yes	
pcr_program_id	Link to PCR Program ID [pcr_program_id] in LIMS PCR protocols [lims_pcr_protocols] table	vvarchar (50)	Yes	
pcr_reaction_id	Link to PCR Reaction ID [pcr_reaction_id] in LIMS PCR Reactors [lims_pcr_reactors] table	vvarchar (50)	Yes	

## 21- LIMS PCR Reactors [lims\_pcr\_reactors]:

These ranges are not restricted by data base, but client-side validations will restrict the user to enter data with in the range given.

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
pcr_reaction_id	PCR Reaction ID	vvarchar (50)	Yes	PRIMARY KEY
crop	Crop	vvarchar (50)		
user_id	Link to User ID [user_id] in Users' Information [user_info] table	vvarchar (255)		
total_volume	Total Volume - $\mu$ l (5 - 100)	float8		
primer_conc	Primer concentration (pmoles: 0.1 - 9; ng: 10 - 50)	vvarchar (50)		
primer_unit	Primer unit	float8		
primer_stock_conc	Primer stock concentration - pM/ $\mu$ l (2 - 100)	float8		
primer_volume	Primer volume	vvarchar (50)		
dntp_conc	dNTP concentration - mM (0-3)	float8		
dntp_stock_conc	dNTP stock concentration - mM (1-10)	float8		

dntp_volume	dNTP volume	float8		
buffer_conc	Buffer concentration	float8		
buffer_stock_conc	Buffer stock concentration - X (1)	Int4		
buffer_volume	Buffer volume	float8		
mgcl2_conc	mgcl2 concentration - mM (0-5)	float8		
mgcl2_stock_conc	mgcl2 stock concentration - mM (10-50)	float8		
mgcl2_volume	mgcl2 volume	float8		
taq_conc	Taq concentration - units (0-1.5)	float8		
taq_stock_conc	Taq stock concentration : Taq Enzyme (u/μl) units/μl (0.5-250)	float8		
taq_volume	Taq volume	float8		
dna_conc	DNA concentration - ng (0 - 20)	float8		
dna_stock_conc	DNA stock concentration - ng/ul (2.5 - 100)	float8		
dna_volume	DNA volume	float8		
Water	Water	float8		
q_soln	Q-soln (e.g. none, 0.5 x finalconc, 1 x finalconc)	varchar (50)		
pcr_additives_name	PCR additives name	varchar (50)		
pcr_additives_	PCR additives concentration (e.g. ng, mM,	float8		

conc	pmole)			
taq_buffer - manufacur er	Taq buffer manufacturer	varchar (50)		

### 22- LIMS Temporary Multiplex [lims\_tmpmultiplex]:

This is a temporary table used by the LIMS system. This table does not contain any data, it is used while creating multiplex sets. After the sets are created the data temporarily stored will be deleted by LIMS System. (SampleTracking → MarkerSelection → Multiplex → New Multiplex)

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
marker_name	Link to Marker Name [marker_name] to LIMS PCR Markers [lims_pcr_markers] table	varchar (255)	Yes	
Status	Status: yes & no	varchar (15)		
user_id	Link to User ID [user_id] in Users' Information [user_info] table	varchar (50)	Yes	

### 23- Plate Association [plate\_association]:

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
pcr_plate_id	Link to PCR Plate ID [pcr_plate_id] in PCR Tracking [pcr_tracking] table	varchar (255)	Yes	
multiplex_id	Multiplex ID Link to LIMS Multiplex markers [lims_multiplex_markers]	varchar (15)	Yes	
part_of_plate	Part Of Plate	varchar (50)		

### 24- DNA Electrophoresis [dna\_electrophoresis]:

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
pcr_plate_id	Link to PCR Plate ID [pcr_plate_id] in PCR Tracking [pcr_tracking] table	varchar (255)	Yes	

electrophoresis_type	Electrophoresis type: PAGE or Capillary.	vvarchar (50)	Yes	
upsc_id	Link to Study ID [upsc_id] in study information [user_psc] table	vvarchar (500)	Yes	
date_of_creation	Date of Creation: LIMS adds value of this field automatically	Timestamp	Yes	
date_of_correction	Date of Correction: LIMS adds and update the value of this field automatically	Timestamp		

### 25- Gel Electrophoresis [gel\_electrophoresis]:

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
pcr_plate_id	Link to PCR Plate ID [pcr_plate_id] in PCR Tracking [pcr_tracking] table	vvarchar (255)	Yes	
marker_name	Link to Marker Name [marker_name] to LIMS PCR Markers [lms_pcr_markers] table	vvarchar (255)	Yes	
gel_type	Gel type (e.g. Agarose, Metaphor, Polyacrylamide)	vvarchar (255)	Yes	
Composition	Composition (%)	Float4	Yes	
voltage	Voltage (V)	Int4	Yes	
duration	Gel running Duration (Hrs)	float8	Yes	
detection_method	Detection method	vvarchar (500)	Yes	
amp_size	Amp size	vvarchar (255)		
gel_image	Gel image	vvarchar (255)		
data_file	Data file	vvarchar (255)		

### 26- CE Electrophoresis [ce\_electrophoresis]:

(SampleTracking → Electrophoresis → Capillary → Plt file generation)

<b>Field name</b>	<b>Description</b>	<b>Data type (&amp; Size)</b>	<b>Required (NOT NULL)</b>	<b>Index</b>
pcr_plate_id	Link to PCR Plate ID [pcr_plate_id] in PCR Tracking [pcr_tracking] table	varchar (255)	Yes	
marker_name	Link to Marker Name [marker_name] to LIMS PCR Markers [lims_pcr_markers] table (if 3100/3130 or 3700/3730)	varchar (255)		
color_info	Color information: (if 3100/3130 or 3700/3730 )	varchar (255)		
color_comment	Color comment: (if 3100/3130 or 3700/3730)	varchar (255)		
project_name	Project name: (if 3100/3130 or 3700/3730)	varchar (255)		
run_module	Run module (e.g. GeneScan2_POP6DefaultModule, SNP2_POP5DefaultModule, GeneScan2_POP6_nofoil, GeneScan2_POP6_2hr, GeneScan2_POP6_2_5hr ...) (if 3100/3130 or 3700/3730)	varchar (255)		
analysis_module	Analysis module (e.g. GS120Analysis.gsp, GS350Analysis.gsp, GS400CubicAnalysis.gsp, GS400HDAnalysis.gsp, GS400Ord2Analysis.gsp, GS500Analysis.gsp ...) (if 3100/3130 or 3700/3730)	varchar (255)		
analysis_method	Analysis method (if 3130)	varchar (255)		
result_group	Result group (if 3130)	varchar (255)		
instrument_	Instrument protocol (if 3130)	varchar (255)		

proto col				
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### 27- Sample preparation [sample\_preparation]:

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
project_name	Project name: will be given by user as input from a jsp page.	vvarchar (255)	Yes	
pcr_plate_id	Link to PCR Plate ID [pcr_plate_id] in PCR Tracking [pcr_tracking] table	vvarchar (255)	Yes	
plate_number	Plate number	vvarchar (255)	Yes	
operator	Operator: Link to User ID [user_id] in Users' Information [user_info] table operator is user & it will be given as input by user in the jsp page.	vvarchar (255)	Yes	
upsc_id	Link to Study ID [upsc_id] in study information [user_psc] table	vvarchar (500)	Yes	
date_of_creation	Date of Creation: LIMS adds value of this field automatically	Timestamp	Yes	
date_of_modification	Date of Correction: LIMS adds and update the value of this field automatically	Timestamp		

### 28- Sample preparation data [sample\_preparation\_data]:

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
pcr_plate_id	Link to PCR Plate ID [pcr_plate_id] in PCR Tracking [pcr_tracking] table	vvarchar (255)	Yes	
row_id	Row code	vvarchar (2)	Yes	
col_id	Column number	Int2	Yes	
Ssrs	Ssrs: Combination of Template value & markers	vvarchar (100)	Yes	

Dilution	Dilution	vvarchar (50)	Yes	
vol_loaded	Volume Loaded	vvarchar (50)	Yes	

**29- LIMS Output files [lims\_output\_files]:**

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
pcr_plate_id	Link to PCR Plate ID [pcr_plate_id] in PCR Tracking [pcr_tracking] table	vvarchar (255)	Yes	
study_name	Study name: LIMS adds value of this field automatically	vvarchar (255)	Yes	
sourcefile_name	Source file name	vvarchar (255)	Yes	
destinationfile_name	Destination file name	vvarchar (255)	Yes	
Description	Description	vvarchar (255)	Yes	
file_size	File size: LIMS adds value of this field automatically	Int4	Yes	
date_of_upload	Date of upload: LIMS adds value of this field automatically	Timestamp	Yes	
upsc_id	Link to Study ID [upsc_id] in study information [user_psc] table	vvarchar (500)	Yes	

**30- LIMS allelobin output status [lims\_allelobin\_output\_status]:**

Used under: SampleTracking → Final Outputs → Merge file for Allelobin

& SampleTracking → Final Outputs → Call Allelobin

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
study_name	Study Name	vvarchar (255)	Yes	

run_status	Run Status	varchar (20)		
date_of_run	Date of Run	Timestamp		
upsc_id	Link to Study ID [upsc_id] in study information [user_psc] table	varchar (500)	Yes	

### 31- LIMS PCR Protocols [lims\_pcr\_protocols]:

This table is for both Fixed & TouchDown Programs. There are no auto-calculated fields.

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
pcr_program_id	PCR Program ID	varchar (50)	Yes	PRIMARY KEY
crop	Crop	varchar (50)		
user_id	Link to User ID [user_id] in Users' Information [user_info] table	varchar (255)		
initial_denaturation_temp_in_degreec	Initial denaturation temperature in degree (c) (85 to 95)	float8		
initial_denaturation_time_in_mins	Initial denaturation time in minutes (1 to 15)	float8		
cycle_fixed_denat_temp_in_degreec	Cycle fixed denaturation temperature in degree (c) (85 to 95)	float8		
cycle_fixed_denat_time_in_secs	Cycle fixed denaturation time in seconds (10 to 60)	float8		
cycle_touchdown_denat_temp_in_degreec	Cycle touchdown denaturation temp in degree (c) (40 to 65)	float8		

cycle_ touchdown_ denat_time_in_secs	Cycle touchdown denaturation time in seconds (10 to 60)	float8		
cycle_fixed_ temp_in_ degreec	Cycle fixed temp in degree (c) (40 to 65)	float8		
cycle_fixed_ time_in_secs	Cycle fixed time in seconds (10 to 60)	float8		
cycle_fixed_num_of_ _cycles	Cycle fixed num of cycles (30 to 45)	float8		
cycle_ touchdown_ temp_from_in_degree ec	Cycle touchdown temperature from in degree (c) (65 to 55)	float8		
cycle_ touchdown_ temp_to_in_ degreec	Cycle touchdown temperature to in degree (c)	float8		
cycle_ touchdown_ increment_ decrement_in_ degree	Cycle touchdown increment decrement in degree (65 to 55)	float8		
cycle_ touchdown_ cycles_per_ increment_ decrement_in_ degree	Cycle touchdown cycles per increment decrement in degree (30 to 45)	float8		
cycle_ touchdown_ num_of_cycles_at_fi xed_final_temp	Cycle touchdown num of cycles at fixed final temp (5 to 10)	float8		
cycle_ touchdown_ time_in_secs	Cycle touchdown time in seconds (10 to 60)	float8		
fixed_extension_tem p_in_	Fixed extension temperature in degree (c) (60 to 75)	float8		

degreec				
fixed_extension_time_in_mins	Fixed extension time in minutes (20 to 120)	float8		
touchdown_extension_temp_in_degreec	Touchdown extension temperature in degree (c) (60 to 75)	float8		
touchdown_extension_time_in_mins	Touchdown extension temperature in minutes (5 to 30)	float8		
final_extension_temp_in_degreec	Final extension temperature in degree (c) (60 to 75)	float8		
final_extension_time_in_mins	Final extension temperature in minutes (5 to 30)	float8		

### 32- LIMS PCR Markers [lims\_pcr\_markers]:

This table includes markers related information

Field name	Description	Data type (& Size)	Required (NOT NULL)	Index
marker_name	Marker name	varchar (255)	Yes	PRIMARY KEY
pcr_program_id	Link to PCR program ID [pcr_program_id] in LIMS PCR protocols [lims_pcr_protocols] table	varchar (50)	Yes	
Crop	Crop	varchar (50)		
user_id	Link to User ID [user_id] in Users' Information [user_info] table	varchar (255)		
pcr_reaction_id	Link to PCR Reaction ID [pcr_reaction_id] in LIMS PCR Reactors [lims_pcr_reactors] table	varchar (50)	Yes	
electrophoresis_type	Electrophoresis Type (e.g. PAGE, Capillary, Both)	varchar (50)		
marker_type	Marker Type (e.g. SSR, EST, AFLP, ISSR, RAPD,	varchar		

e	CISP, SNP, COS)	(50)		
primer_sequences_forward	Primer Sequences Forward	varchar (4000)		
forward_primer_label	Forward Primer Label (e.g. none, 6FAM, NED, PET, VIC, HEX)	varchar (50)		
motif	Motif	varchar (255)		
primer_sequences_reverse	Primer Sequences Reverse	varchar (4000)		
reverse_primer_label	Reverse Primer Label (e.g. none, 6FAM, NED, PET, VIC, HEX)	varchar (50)		
expected_product_size	Expected Product Size	varchar (50)		
primer_origin	Primer Origin	varchar (255)		
linkage_group	Linkage Group	varchar (50)		
linkage_group_origin	Linkage Group Origin	varchar (255)		
optimised_on_genotypes	Optimized on Genotypes	varchar (50)		
allele_size_range	Allele Size Range	varchar (200)		
no_of_alleles	No of alleles	varchar (200)		