

# FREP Quality Assurance and Quality Control Integrated Implementation Strategy and Work Plan for 2005/06



FREP Quality Assurance Working Group  
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## **1.0 Introduction**

This document describes the quality assurance (QA) and quality control (QC) implementation strategy and work plan for the FPRA Resource Evaluation Program (FREP) for 2005/06. The implementation strategy addresses integrated QA and QC mechanisms for FREP as a whole, while the work plan focuses on quality processes related to resource stewardship monitoring (RSM) activities for Riparian/Fish and Stand-level Biodiversity.

This is the first step in implementing a comprehensive, program-wide quality management system for FREP. The QA/QC implementation strategy and work plan outlines the tasks involved in matching data quality standards to the business requirements of FREP as described in the quality assurance criteria discussed in the FREP Quality Assurance Framework. In keeping with FREP's focus on continual improvement, the implementation strategy and work plan for 2005/06 will be assessed and revised based on lessons learned from implementing RSM for riparian/fish and stand-level biodiversity. This information will be used to develop and improve future QA/QC implementation strategies and work plans, beginning in 2006/07.

## **2.0 Data Quality Objectives and Criteria**

It is critical to link data quality to the business requirements of FREP. Quality is often perceived subjectively, as different perspectives impose different quality standards. Therefore, to remove this subjectivity, the quality of the data should be derived directly from business requirements.

The FREP Information Management System (FIMS) group is responsible for identifying the information needs and business requirements, and for specifying data quality standards for the information collected for FREP. The FIMS group does not determine the type of data collected, but rather how the information is used. This process is currently underway and FIMS will ultimately include benchmarks to specify the level of data quality required. Since data quality levels have not yet been established, the data quality objectives for 2005/06 focus on a few, but vital set of data quality criteria. FIMS is described in more detail in Appendix E.

Figure 1 illustrates the links between the data quality and FREP business requirements. Data quality is achieved through all the activities and processes of checklist design, training, field protocols, data entry, data validation and cleaning, and data summary and analysis. The quality level of each of the activities and processes needs to meet the quality requirements of the data summary. For example, the checklist must be designed in the format required by the data summary. In the case of Riparian/Fish Resource Stewardship Monitoring (RSM), if the data summary requires the source of impact to be recorded by the stream class, then the

checklist needs to ask questions regarding the impact source and stream class. Checklist design must consider the best format for data collection and summary, so that the data retains its quality and meaningfulness during the processes of data entry, validation, cleaning and analysis.

The information needs must also have a set of requirements that the data summary meets. Depending on the level of evaluation intensity, RSM may require different information needs. For example, routine RSM requires information in more general terms. The Riparian/Fish routine RSM seeks an overview assessment of a stream reach, where the conclusion is drawn by the number of No answers in the checklist. The data quality objectives, criteria and indicators ensure that the data is summarized in a manner that meets the business requirements. For extensive RSM, the standards for data quality are higher because the information needs are more demanding, and the business requirements are based on a more complex decision-making process.

Since the business requirements for FREP are still under development, linking data quality to business requirements will be developed in the near future. Once business requirements are established, information needs can be determined along with the appropriate level of data quality. To accomplish this, FREP will need an effective communications and decision-making process between establishing business requirements and information needs.

Data Quality Objectives (DQOs) are quantitative and qualitative statements that clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that are used as the basis for establishing the quality and quantity of data needed to support decisions. DQOs directly meet the requirements of the information needs.

Data quality criteria<sup>1</sup> for 2005/06 were generated from QA/QC tools used by the U.S. Environmental Protection Agency (EPA)<sup>2</sup>. The data quality criteria targets used for implementing Stand-level Biodiversity and Riparian/Fish RSM are presented in Table1.

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<sup>1</sup> Data quality criteria are accuracy, precision, completeness, representativeness, and comparability.

<sup>2</sup> Vast numbers of agencies and government bodies adopted EPA data quality criteria for their data quality needs and requirements. Agencies and government bodies such as the UNECE Task Force on Monitoring and Assessment, US Department of the Interior, the US Geological Survey, the Minnesota Pollution Control Agency, and the States of California Quality Assurance Management Plan use the EPA data quality criteria as a standard of practice. See figure 2 for detail.

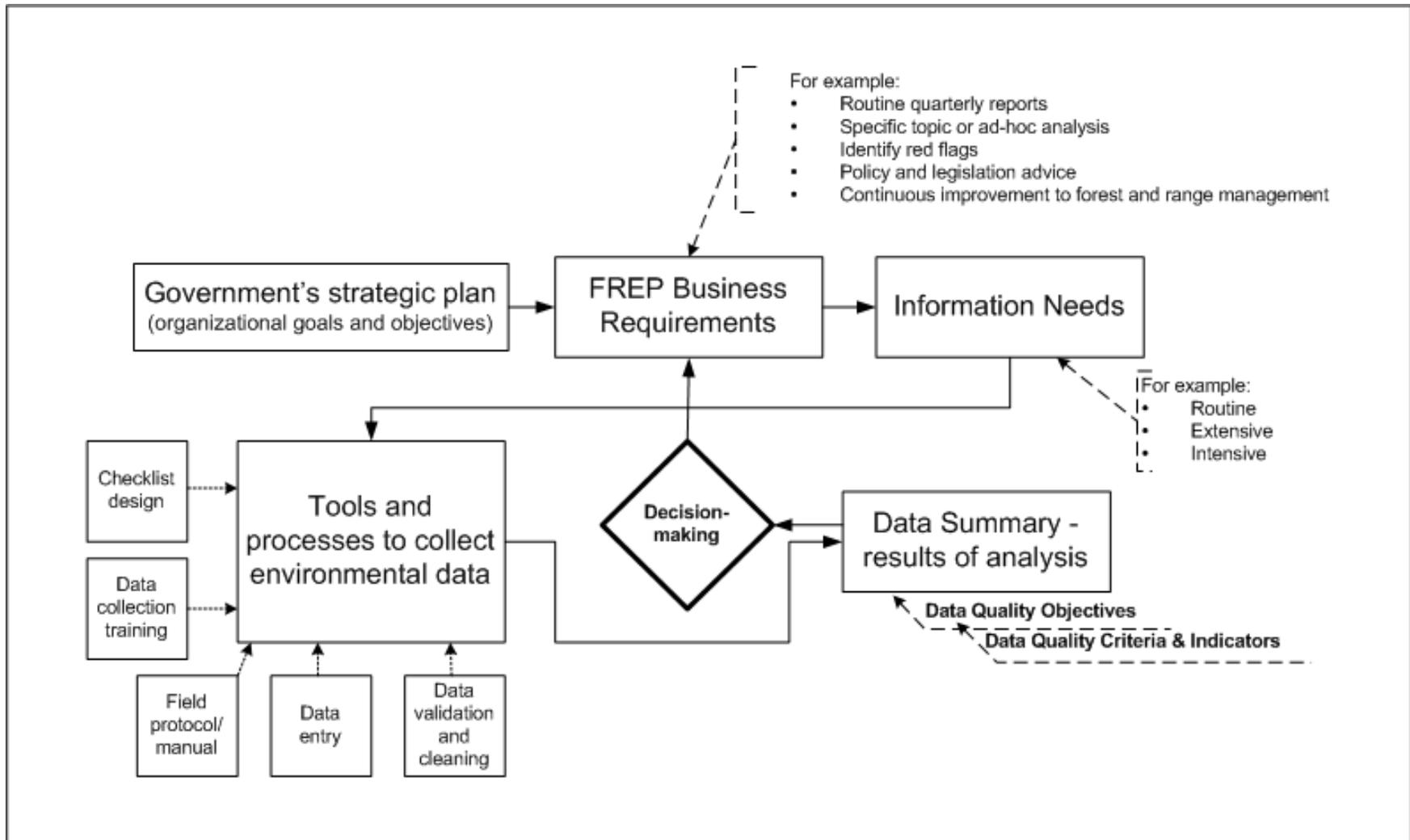


Figure 1. Data meeting business requirements.

Data Quality		Stand-level Biodiversity					Riparian/Fish		
Criteria ↓	Objectives →	No missing pages	Less than 1% blank or missing value	Score on self-assessment	Consistency among three cards – block, reserve, and plot	Qualitative data recorded	Zero errors on number of Yes and No answers	Recorded Field data	Qualitative comments recorded
<b>Precision</b>				100%					
<b>Accuracy</b>				100%			100%		
<b>Completeness</b>		100%	99%	100%		✓	100%	✓	✓
<b>Representativeness</b>					100%			✓	
<b>Comparability</b>					100%		100%		

Table 1 – Data quality objective and criteria matrix.

#### Stand-level Biodiversity – DQOs

1. Number of missing page(s) on all three levels of the checklists - block, reserve and plot levels.
2. Achieve 99% blank free rate on all fields.
3. Built-in self-assessment questions on the checklists and the mail-in check sheet should be completed and achieve 100% answer rate.
4. Block identifying information is consistent among the block, reserve, and plots card. Specifically the fields of Opening number, Opening ID, Licence number, CP number, Block, Reserve ID, and Reserve type.
5. Qualitative fields are answered and captured in the database.

#### Riparian/Fish – DQOs

1. The total number of “Yes”, “No”, and “N/A” from the sub-questions add up correctly to the conclusion of “Yes”, “No”, or “N/A” for questions 1 to 15. Based on the number of “No’s”, arrive at the correct final conclusion.
2. Field data are recorded on pages 12 to 14 of the checklist, and they support questions 1 to 15.
3. Qualitative fields are answered and captured in the database.

### **3.0 QA and QC Project Task Description**

All QA and QC project tasks are illustrated in Figure 2. Quality assurance is expressed at the program level. Quality control is expressed at the project level through protocols and quality tools.

#### **Program level – quality assurance**

The following are the quality assurance activities at the program level for 2005/06:

1. Forest Practices Board audit and review – The Forest Practice Board is conducting an audit/review on the performance of FREP. The results and recommendations of the audit will be incorporated as part of FREP's continuous improvement strategy. This audit and review by the Forest Practices Board will be followed by another third-party external review of FREP in 2007/08.
2. Continuous Improvement (CI) – FREP strongly embraces CI. All results and feedback from various program activities are incorporated back into the program, including activities such as training, field testing checklists, quality control, data entry, data cleaning, questionnaires and surveys, workshops, and debriefings. CI is an iterative learning process that improves FREP in many ways. Appendix C and D illustrate the CI approach and the Plan-Do-Study-Act cycle.
3. External stakeholder meetings – As per the FREP communications plan.
4. Overall client satisfaction survey – A client (external and internal) satisfaction survey will be conducted in 2006/07.

#### **Project level – quality control**

1. Five quality control protocols – See Section 4 for a complete description of the five protocols and the Gantt charts in Appendix B.
2. Self-assessment on the Stand-level Biodiversity checklist (Form C of the checklists) – Four self-assessment questions are built into the Stand-level Biodiversity checklist. The questions refer to the completeness of the checklist being filled, and the accuracy and precision of visual estimates. The self-assessment questions also stress the importance of completing the checklist on site. The last question reminds the evaluator to look for invasive plants, innovative forest practices, and ecological anchors, not only in the plots, but also when travelling between plots. A good quality checklist should answer “Yes” to all four self-assessment questions.
3. Field protocol and manuals – The Stand-level Biodiversity and Riparian/Fish checklists are accompanied by their own field protocol manuals. The manuals clearly describe the questions and fields on the checklists in terms of the correct format, units of measure, choices, and options. The manuals also provide background information such as pictures, diagrams, and

definitions of terminology used on the checklists. The field manuals provide guidance to evaluators, and enhance the accuracy and consistency of the data collection process. Both manuals are used in conjunction with training sessions.

4. Training (classroom and on-site sessions) – Training is provided to field staff for each resource value. Only staff that has completed the required training can collect data on a specific resource value. In classroom training, staff studies the field protocols and manuals, and gather and prepare information on the cutblocks they will evaluate. During the training sessions, staff evaluates several cutblocks together with the trainers so that additional questions can be answered as they arise. The on-site training also provides a foundation for consistency as field staff familiarizes themselves with the checklists and field protocols.
5. Data entry (check sheet, input-mask<sup>3</sup>, and scan & e-mail) – A check sheet accompanies each set of completed checklists. The check sheet screens for missing or incomplete checklists. It also asks field staff to supply maps, Silviculture Prescriptions, and other information and materials that might assist data summary and analysis. The check sheets act as another quality control tool for field staff. Packages of completed checklists are sent to Victoria where data are entered using MS Access 2002 with input-masks and simple validation rules. Data are screened for quality when being entered into the database. Data entry staff is located in the branch office to allow for consultations with Resource Value Teams for interpretations and clarifications on the hand-written checklists. In the event that data entry staff and the Resource Value Team members cannot accurately determine the field on a checklist, or data is missing, the QA and QC coordinator will identify the error in red ink and scan the checklist. In sequence, the coordinator will e-mail the digital scan to field staff for clarification or additional information. The check sheet, the input mask, and the digital scan together make up the quality control process for data entry.
6. Data validation rules and logics, data cleaning – After data is entered, it will go through a rigorous data validation process. A list of rules and logics define the data (i.e., units, format, decimal points, etc.), associations the data should have, and any “if scenarios<sup>4</sup>.” Data are validated and cleaned using these rules and logics. If any data violates the rules and logics, it is cleaned (e.g., manipulated, verified again with field staff, verified with the QA site visit data, reviewed by the Resource Value Team, or excluded from the sample or analysis). Changes to any data are logged, including the name of the reviewer,

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<sup>3</sup> A constraint or set of constraints defines what type and format of data can be entered in certain fields. This feature is most useful for data entry and collection.

<sup>4</sup> “If scenarios” are a series of constraints depending on one previous constraint. For example, if “5” is the answer to question 1, then only value range from 5 to 10 is allowed in question 2. This “if scenario” differs from the “What if scenario”. The “if scenario” is an association of two or more input-masks.

time/date, and the specific changes (before and after). This quality control process will greatly enhance the accuracy and efficiency of data analysis.

7. Data quality criteria – Precision, accuracy, completeness, representativeness, and comparability are typical data quality criteria. From each data quality criterion, data quality indicator is developed. Data quality indicator can be a percentage, a ratio, or a number that express the quality state of the selected data. For example, in Table 1, the number of blanks on the checklist is the quality indicator for “completeness.” The data quality indicator is tied to the data quality objective. In this case, the data quality objective is that we want to achieve less than a 1% blank rate in all checklists received.
8. Questionnaires and surveys – As part of the continuous improvement effort, questionnaires and surveys are utilized to gather user feedback and comments. For example, after the training sessions, questionnaires are circulated to solicit input, concerns and suggestions. In addition, surveys are conducted prior to and after events. For example, a survey is conducted before the data collection; another survey would also be conducted after. This way the two surveys can compare the feedbacks to determine the difference. Questionnaires are also used in workshops and debriefings.

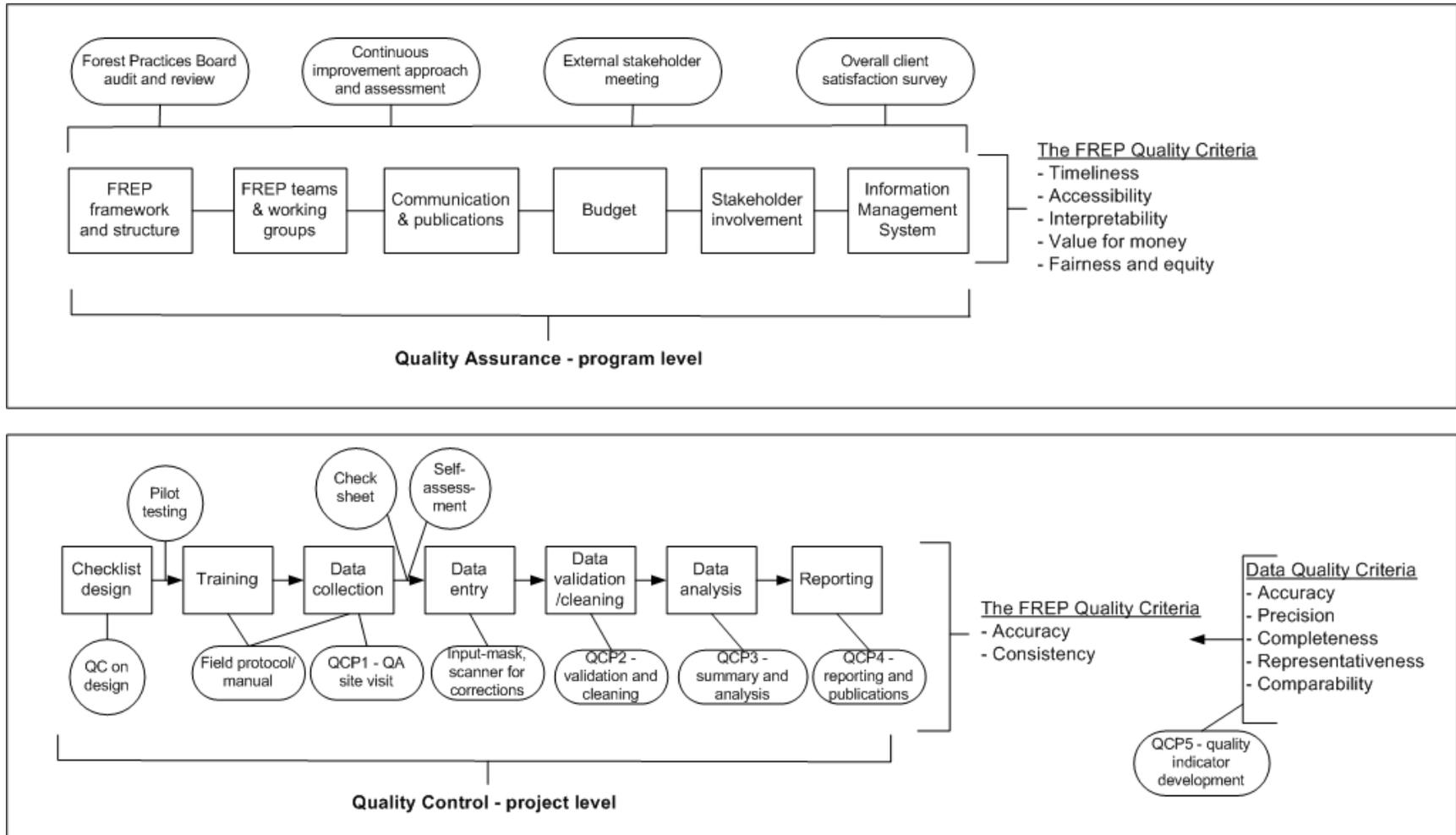


Figure 2 – QA and QC tasks

## 4.0 Quality Control Protocols (QCPs)

In addition to the various quality control tools, QA and QC activities are primarily implemented through quality control protocols. These protocols set standards and identify specifications for areas that require quality control. For example, the first quality control protocol verifies data collection accuracy and precision. To accomplish this, an experienced evaluator is sent to randomly sample the cutblocks that were previously evaluated by field staff. The five quality control protocols for FREP are:

### QCP1 – QA site visits

- QA site visit is a data verification methodology. It assesses data accuracy and precision, and documents all the processes and methodologies employed in the site visit. This is a first attempt to verify the quality of the work completed in the field, and thus this protocol will continuously improve over time.
- The results of the QA site visit are a set of QA data and a report of findings. The QA data will be stored and used as the benchmark for data quality. The report will be used for continuous improvement.

### QCP 2 – Data validation and cleaning

#### 2A – Stand-level Biodiversity

#### 2B – Riparian/Fish

- Stored in Excel spreadsheets, data validation is a list that contains all the questions, checklist fields, and field formats. The list specifies the type and format of data permitted in particular fields, and guides the work of data validation and cleaning.
- The data entry person performs the task of data validation and cleaning as part of the quality control protocol. The data entry person flags invalid questions and fields, and raises the issues with the Resource Value Team Leader and the district staff that filled in the checklist. Together, the Resource Value Team Leader and district staff use their expert opinions to supply additional/new data, or modify the existing data.
- This process is referred to as data cleaning and aims to enhance data quality, but not compromise data accuracy, precision, and representativeness.

### QCP 3 – Data analysis and summary

#### 3A – Stand-level Biodiversity

#### 3B – Riparian/Fish

- This protocol standardizes data manipulation, reduction and summary methods to ensure the accuracy and consistency of data analysis, calculation, and summary.
- The protocol increases data analysis efficiency and produces templates for “canned” reports and analysis.

#### QCP 4 – Reporting and publication

- This protocol follows the Review Standard published by the FREP.
- The protocol categorizes review by different type of documents. A chain of reviewers will examine and approve the documents in the allotted time.

#### QCP 5 – Quality indicators development

- In the FREP Quality Assurance Framework, the working group is determined to develop a set of quality indicators. The quality indicators are derived from the FREP Quality Assurance Criteria<sup>5</sup> and the data quality criteria. This protocol is the first step towards the development of quality indicators.
- This protocol develops quality indicators that have been selected at both the program and project levels.
- It establishes quality targets and Acceptable Quality Level (AQL) for the indicators; however, the targets and AQL require the approval of FREWG and FIMS.
- The protocol designs the displaying method for the quality indicators, and presents tools to improve quality.

## 5.0 QA and QC Reports to Management (FREWG)

QA and QC reports will be produced for FREP management at the end of the evaluation and monitoring cycle for each year. The reports will provide an overall picture of the progress of quality management of the program. On the program level, quality indicators will display the status of program components (budgets, teams and working groups, program framework and structure, the information management system, etc.) based on the terms of the quality assurance criteria (e.g., timeliness, value for money, fairness and equity, and accessibility). On the project level, the report will describe the activities and processes undertaken to control data quality, including quality control protocols, data entry, self-assessment, and other tools.

Furthermore, the QA and QC report will identify shortfalls in the quality level and areas for improvement. Small-scale and simple improvements can be done within the same evaluation and monitoring cycle, while larger scale and more complicated improvements will require more time, perhaps multiple years. Regardless of the complexity and time required for improvement, the effort will be continuous in keeping with FREP's principle of continuous improvement.

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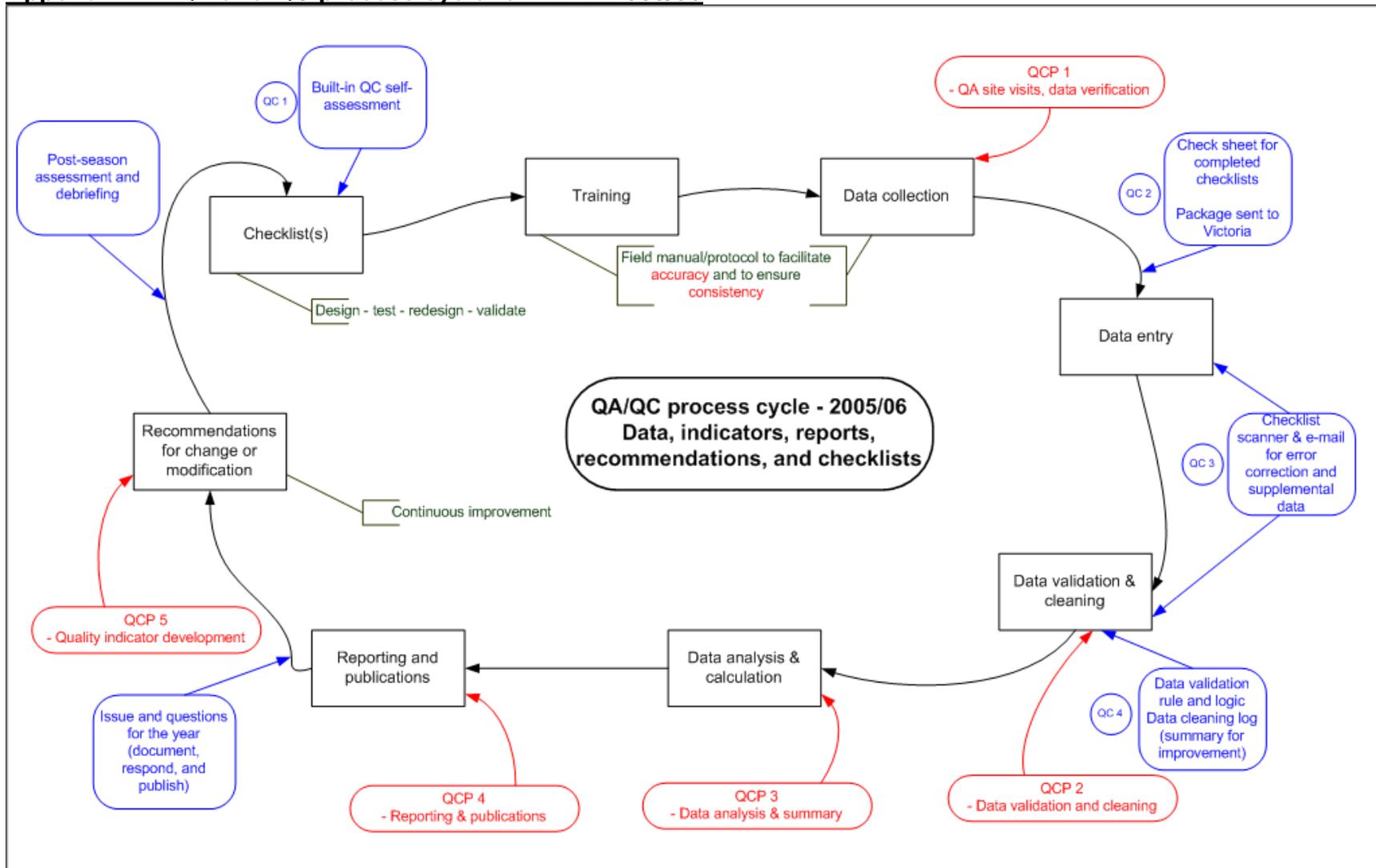
<sup>5</sup> Timeliness, Accuracy, Consistency, Accessibility, Interpretability, Value for Money, Fairness and Equity.

## 6.0 Conclusion

This implementation strategy and work plan is based on the FREP Quality Assurance Framework background paper. As a priority, the implementation strategy and work plan lays out the linkages between data quality, information needs and business requirements. With these linkages identified and clearly defined, the FREP Quality Assurance Framework has a clear sense of direction. Implementations of this work plan will be completed through five quality control protocols and with the assistance of several quality control tools and techniques.

Processes and activities related to QA and QC are summarized by the diagram shown in Appendix A.. Similar to all projects and components of FREP, the principle of continuous improvement also applies to the Quality Assurance Framework (see Appendices C and D).

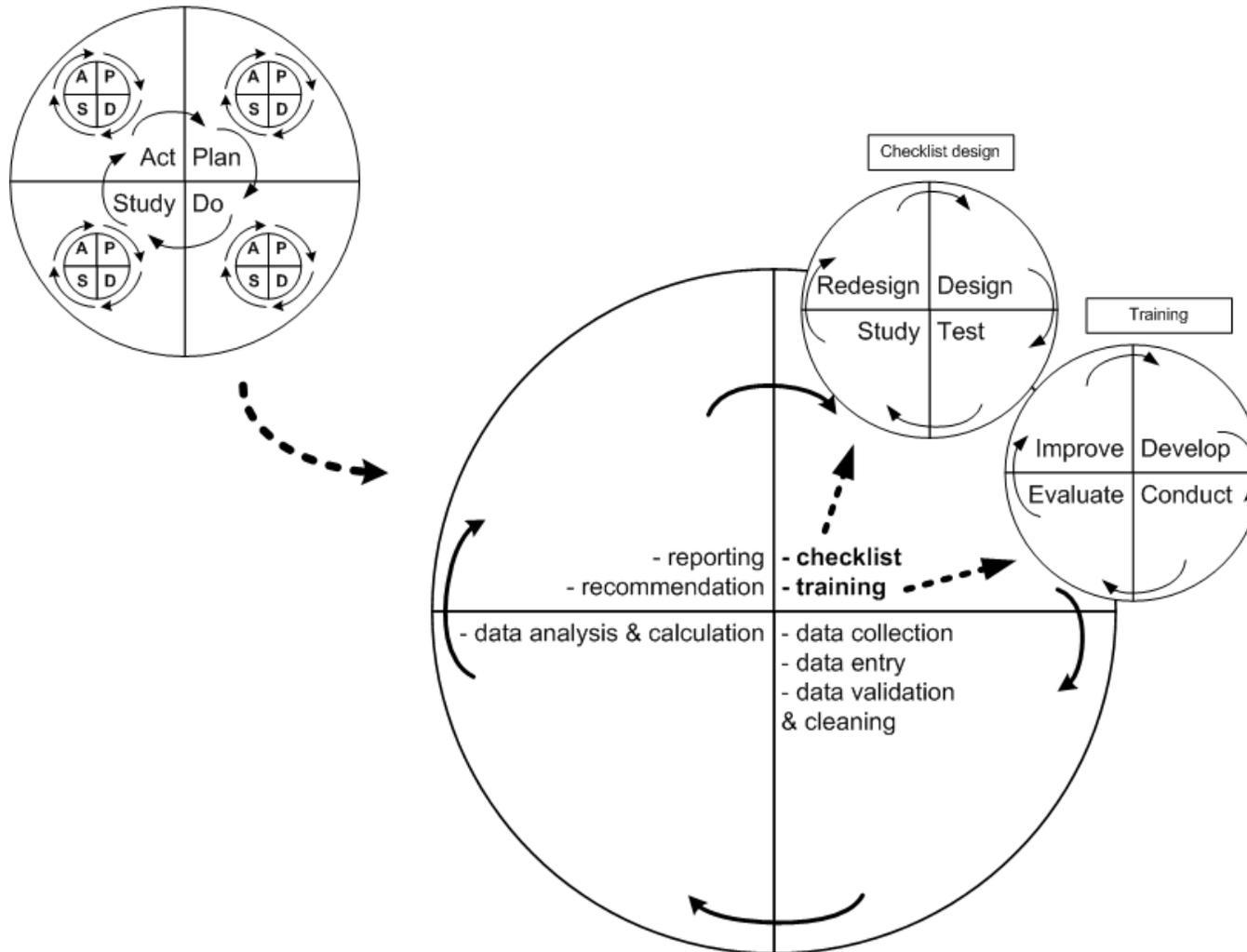
## Appendix A – QA and QC process cycle for FREP 2005/06



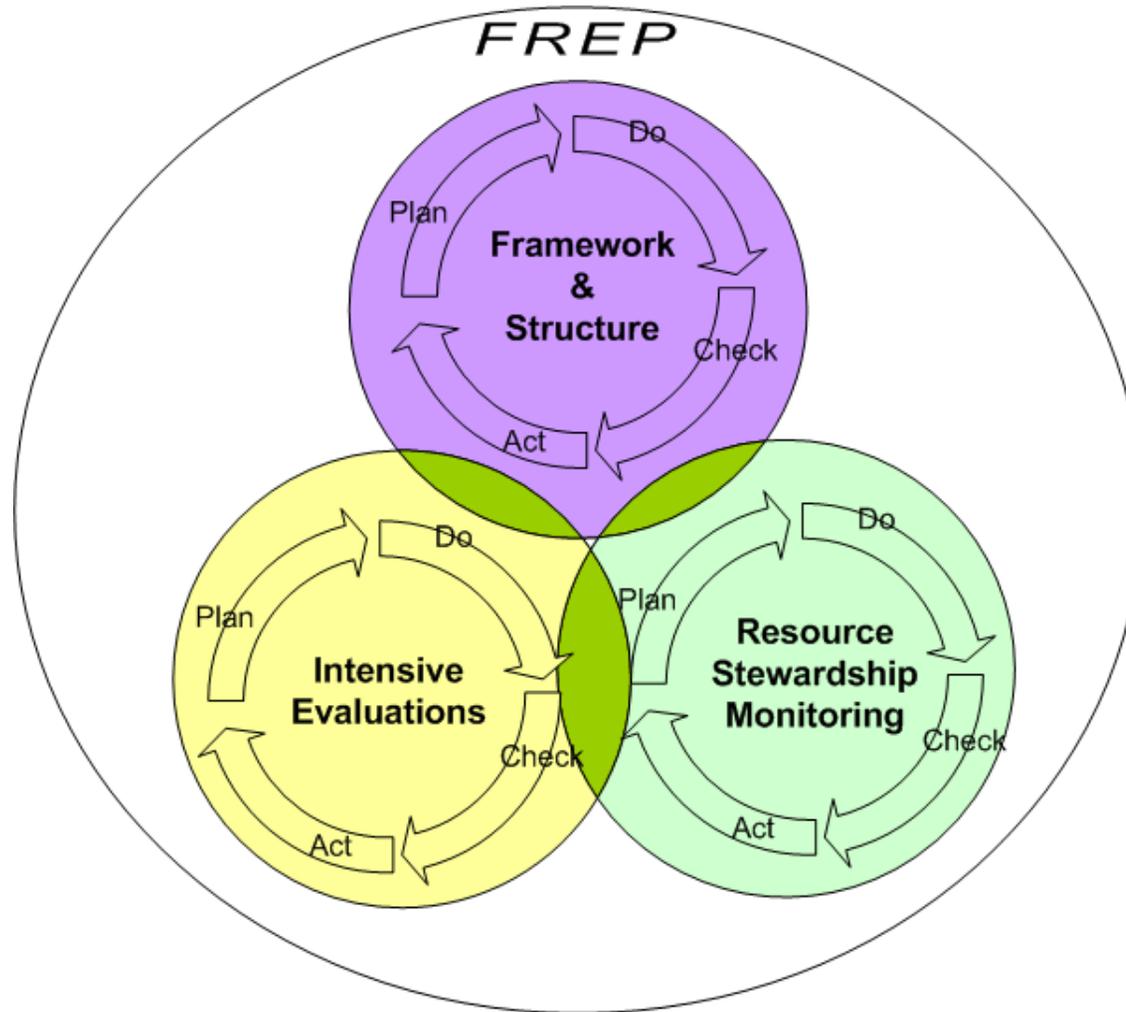
## Appendix B – Gantt charts for quality control tasks

ID	Task Name	Start	Finish	Duration	Sep 2005				Oct 2005				Nov 2005				Dec 2005				Jan 2006				Feb 2006				Mar 2006			
					4/9	11/9	18/9	25/9	2/10	9/10	16/10	23/10	30/10	6/11	13/11	20/11	27/11	4/12	11/12	18/12	25/12	1/1	8/1	15/1	22/1	29/1	5/2	12/2	19/2	26/2	5/3	12/3
1	QCP 1 - QA site visit	19/09/2005	31/10/2005	6.2w	█																											
2	QCP 1 - assessment for QA site visit	04/11/2005	18/11/2005	2.2w					█																							
3	QCP 2 - Data entry, validation, and cleaning	01/09/2005	30/11/2005	13w	█				█																							
4	QCP 3 - Data summary and analysis	25/11/2005	31/01/2006	9.6w									█																			
5	QCP 4 - Reporting and publications	01/09/2005	28/10/2005	8.4w	█																											
6	QCP 5 - Quality indicator development	17/10/2005	30/12/2005	11w					█																							
7	QA/QC report to management	30/12/2005	30/03/2006	13w													█															

**Appendix C – The PDSA cycle and continuous improvement**



Appendix D – PDSA cycle within the FREP framework



## **Appendix E. The FREP Information Management System (FIMS)**

FIMS has two major roles that link to the FREP Quality Assurance Framework:

1. It is a FREP information management system (system is developed by the capture of FREP business requirements)
2. It contains the information collected through RSM and intensive evaluation activities and is used to analysed and report on the data.

Data management, as identified in the FIMS project plan involves the following activities and processes related to data quality:

- Design and planning
- Data entry
- Validation and cleaning
- Analysis and calculation
- Interpretation
- Reporting and publication
- Storage and integration.

All data management activities and processes are subject to quality assurance and quality control. Therefore data management and QA/QC should work together to design, plan, and implement quality in the FIMS project.

The data and the data quality to the business requirements are aligned in the following logical manner:

Data – Data quality – Data quality criteria – Data quality objective – Information needs – Business requirements (see figure 1).