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**Implementation of IACS-GIS, Reg. 1593/00
and 2419/01**

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1. Introduction

1.1. Purpose of this document

- 1.1.1. The purpose of this document is to outline the main points to be assessed by the Commission for compliance by Member States with the regulations referring to the implementation and management of the Integrated Administration and Control System (IACS). This document is limited to the management and control of area based subsidies and focuses in particular those aspects related to the use of geographical information systems (GIS).
- 1.1.2. While this report will discuss many aspects of the implementation strategies that could be adopted, it is not the intention here to discuss the merits of different approaches (cadastre referencing versus block systems, for example).
- 1.1.3. Furthermore, the expected functional performance evaluation of the IACS-GIS will not be limited to the implementation of one or other software environments; the administration and control system must instead be developed as a function of the particular choices (parcel referencing system used in the Land Parcel Identification System (LPIS), application process management, use or not of orthophotos, etc.) made within each Member State for the basic structure of the system.
- 1.1.4. This version is a discussion document intended to introduce the issue to Member States.

1.2. Document structure

- 1.2.1. The document begins with a short review of the existing legislation with respect to GIS requirements for compliance. Following this section, the document is split into three technical sections:
 - LPIS creation and use in the application process
 - Administration and cross checks
 - On the spot checks, including remote sensing controls
- 1.2.2. Each section will introduce the GIS-related concepts involved, followed by a table of critical points to be used for compliance assessment. Points that could be considered for proposal as amendments to the Commission Regulation 2419/01 are indicated in the tables.

1.3. Preceding documentation

- 1.3.1. A number of document sources have been referenced in the preparation of this report:
 - Internal memorandum "*Monitoring and Evaluation of IACS implementation for the identification of agricultural parcels in MS of the EU: synthesis of technical alternatives*" (S. Kay 1994)
 - Final report "*Feasibility of using GIS technologies for managing the graphical component of the Integrated Administration and Control System (IACS)*", prepared under contract for DG-AGRI by SWK/GISL, 1997.

- Discussion paper “*Land Parcel Identification Systems in the frame of Regulation (EC) 1593/2000 (Version 1.4)*” (Mars ref: OL/I03/M2580/01), O. Léo & G. Lemoine (2001), circulated by DG-AGRI in the context of IACS expert group meetings.

1.3.2. The regulatory basis used is that of the current framework:

- Council Reg. 3508/92, in particular the amendment 1593/00.
- Commission Reg. 2419/01

2. Direct requirements specified in the legislation

2.1. Regulation 3508/92

2.1.1. The original regulation still contains elements of reference: indeed, may be considered as the primary source of requirements even if not specific to GIS.

2.1.2. For example, Art. 3 includes limitations on the archiving of application data, which will affect the storage and tracing of changes to parcel reference data. Furthermore, a number of definitions are included (e.g., agricultural parcel) which are fundamental to the system.

2.1.3. Art. 3 furthermore conditions the manner in which data can be decentralised, an important aspect of contemporary systems.

2.1.4. The Annex to Reg. 3508/92 furthermore identifies which schemes need to be managed with the IACS in a compatible manner.

2.2. Amendment 1593/00

2.2.1. Although the regulation 1593/00 is clearly the basis for the introduction of the GIS component in the IACS, few specific functions of this enhancement are included. A more complete analysis is included in another discussion paper (Léo and Lemoine 2001), although of note:

- “...Use shall be made of computerised geographical information system techniques including preferably ... orthoimagery...” (3508/92 Art. 4, or 1593/00 Art 1.3)
- “... Member States shall simplify the application process by distributing pre-printed forms based on the areas determined in the previous year and supplying graphical material, as referred to in Article 4, indicating the location of those areas.” (3508/92 Art 6.3, or 1593/00 Art 1.44 (b)).
- The level of precision demanded by the data set managed by the GIS shall be equal or better than that of a 1:10,000 scale cartographic equivalent (3508/92 Art. 4, or 1593/00 Art 1.3)

2.2.2. The Annex to Reg. 1593/00 furthermore identifies area aid schemes required to be handled in a manner compatible with the IACS.

2.3. Regulation 2419/01

2.3.1. The object of this regulation is the specification of rules for the implementation of Reg. 3508/92¹. Nevertheless, it is once again limited in the direct references to the management of data through GIS techniques or the expected use to be made of (geo)graphical or spatial data.

2.3.2. A major intention of the use of GIS would be to enhance the performance of administrative checks for control of double declarations and eligibility. However, Art. 16 does not include any specific mentions as to how this would be achieved using the GIS; instead determination of “appropriate means” is left open to each Member State (although note that area calculation should meet the cartographic specification of 1:10,000 scale specified in Art. 4 of 3508/92).

- Concerning the aid application itself: no direct reference is made, but agricultural parcel identification is expected to be improved through use of the GIS.
- While there is no direct requirement for the use of the GIS in risk analysis for on-the-spot checks of applications, selection criteria include an analysis of the “number of agricultural parcels and the area” (Art. 19, 1(b))

2.3.3. Although a paper application process seems primarily required by Reg 3508/92 (Art. 3) (cf. above), the use of “computerized GIS techniques” encourages some kind of electronic or computerized exchange of data.

- Reg. 2419/01 (Art 11.1 (c)), nevertheless, requires absence of “discrimination between farmers using non-electronic means of submission” and those using other forms, for example via the internet, networks, etc.
- Furthermore, Art. 11.2 requires assurances concerning the reliability and security of the electronic system appropriate for the “proper management of the aid schemes involved”.

3. LPIS creation and use in the application process

3.1. Direct support to farmers’ applications

3.1.1. Locating and measuring agricultural areas create wide-ranging difficulties for farmers who are not technically prepared for the task.

- The GIS should facilitate the geographical identification of the agricultural parcel as it is known to the farmer. Ideally, the GIS should manage the agricultural parcel that is in any case reflected in the standard, alphanumeric part of the IACS database.
- The IACS reference parcel information that is recorded in the GIS (either agricultural parcel or reference parcel) should be easily accessible to the applicant. This should be provided in the form of printed application forms, including some kind of mapping support. It is expected that this support be given to farmers not later than 2004 for the first time.

¹ Reg. 2419/01 repeals Reg. 3887/92 and integrates the numerous amendments made to that latter regulation.

- The mapping support provided to the farmer should include enough detail (ideally, a recent orthophoto background, topographic features, place names etc.) to permit fast and reliable location of the parcels.

Application process		Date to be implemented	Amendment proposed
<i>Direct support to farmers' applications</i>			
3.1.1	Identifying, locating and measuring reference parcels	First documentation to farmers	Yes
3.1.1	Printed application forms	First documentation to farmers	Already in 1593/00
3.1.1	Enough detail (e.g., topographic mapping, recent orthophoto, place names etc.) to permit fast and reliable location of the reference/agricultural parcels	First documentation to farmers	Yes
3.1.1	Area of the reference parcel (block, ilot), net of ineligible areas, should be provided to the farmer	First documentation to farmers	Yes
3.1.1	Application form data includes the GIS information (boundary, map, area) from previous year	First use of system, no later than 2005 application year	Yes

3.1.2. Both the applicant and the Member State authority benefit from the use of orthophotography. In practice, orthophotography can be used as a secondary data source, either to complement an existing identification system (for example, a land register), or as the primary basis for an identification system internal to IACS.

3.1.3. While their use is not obliged in the regulations, orthophotographs are undeniably more revealing than simple maps. Firstly, there are far fewer errors of localisation, thanks to landmarks recognised by the applicant (trees, hedges, buildings, ditches, etc.). Secondly, a recent photograph taken on a known date allows existing reference maps to be subdivided more efficiently by better locating the current boundaries of reference parcels related to a particular applicant.

- Where orthophotos are used, these should be of the correct specification:
 - Geometry equivalent or better than to 1:10,000 scale Class 1 mapping (2.5m 1-D RMS)
 - Radiometry 8-bit (panchromatic), 24-bit (colour), pixel size 1m or smaller
- They should also be less than 5 years old and with respect to standard comply with the general regulations and working documents (i.e. resolution, geometric quality).

3.1.4. Measuring distance and surface area in the GIS permits a first check of the areas being declared, even during the application process if this is the approach adopted by the Member State. Such an approach allows the authority to take a firmer line on problems and, in certain cases, to identify and solve any problems with the declaration at source. This is an important factor in the simplification of the application process.

- A reference area, above which a farmer would not be expected to claim without proof of change of the parcel, must be recorded for all parcel objects in the GIS. This area will be calculated by the GIS using the applicable national projection and ellipsoid. It shall have a status at least equal to other official documents accepted by the national administration in respect of area aid claims.
- The IACS GIS parcel (reference or agricultural, depending upon the system) will have a legitimate status with respect to other data sources (cadastre, topographic mapping).

LPIS Creation and Use: Application process		Date to be implemented	Amendment proposed
<i>Use of orthophotography</i>			
3.1.3	Where orthophotos are used, these should be of the correct specification (image quality and geometric quality), according to current guidelines and working documents.	From first use	No
3.1.3	Orthophotos must also be of a suitable date (maximum 5 years old)	From first use	Yes
<i>Measuring distance and surface area in the GIS</i>			
3.1.4	Legal status shall be confirmed for the GIS derived areas of parcels in such a way that reductions can be derived from their use.	First use of GIS	No (Covered by current IACS regulations)
3.1.4	Areas will be determined in the GIS using a technical tolerance of maximum 1.5m on the parcel perimeter.		Yes
3.1.4	GIS should be able to perform topological coherent operations (area, perimeter, distance, intersection, etc.) in national geodetic system; areas shall be projected.	First documentation to farmers	Yes
3.1.4	GIS should permit the identification – automatically – of applications with problems associated with over-declaration of reference parcel areas	First use of system, no later than 2005 application year	Yes
3.1.4	Functionality to ensure the identification of double-declared areas	First use of system, no later than 2005 application year	Yes
3.1.4	In case of a reference parcel system, efficient structure (75%/90% rule) of reference parcels	1.1.2005	Yes

- A technical tolerance for parcel area measurement at least compatible with the equivalent mapping scale of the system may be applied; this will not be greater than a 1.5 m buffer multiplied by the perimeter of the object being measured.
- The IACS GIS should permit the identification – automatically – of applications with problems associated with over declaration of reference parcel areas. This is a function that must be implemented at the earliest stage of the system and thus should exist from the first use (and has been required by IACS since 1996 anyway); it will be the primary means of identifying anomalies in the creation of the LPIS.

- Furthermore, functionality to ensure the identification of double-declared areas – and quick resolution of any consequent propagation of errors to applications linked to the same reference parcel – must be implemented. Again, this function is required to solve anomalies during the creation of the system and needs addressing at an early stage in the development.
- In order to ensure that the IACS GIS is capable of identifying double declared areas efficiently in the case of the use of a block system, they should be created and maintained to ensure that the area enclosed by the boundary is mostly eligible. To meet that goal, at least 75% of declared parcels should be eligible for declaration for at least 90% of their area, a figure that should be confirmed through on-the-spot controls. However, it may only be at the final stage of the refinement of the LPIS, i.e. in preparation for the 2005 application campaign, that this is achieved.

3.2. Distributed management of the LPIS creation and application process

3.2.1. Agricultural associations may play an important role in the process. Making GIS data available as a management aid could motivate them to provide a service that is often otherwise the responsibility of the authority, either by providing support for the application process, or by resolving irregularities. Alternatively, the interface with farmers may be handled by a national administration body. It is probable, however, that the system will include some delivery of data to a distributed source (possibly even client IT systems) and that also some return data flow must be managed and processed.

- Where MS administrations collaborate with such associations, the provision of GIS (and alphanumeric) data should be of a high standard; this is a requirement particularly during the initial creation of the LPIS.
- The data should also be current, to ensure that contact is not made with farmers using a dataset that is not synchronised, either because it has been modified by other applicants/associations, or because new anomalies have been identified in the application process but not yet notified down the user hierarchy (i.e. from a centralised control level to the distributed use of the system).
- In particular the resolution of anomalies must be efficiently handled (particularly with respect to time).
- Furthermore, for the data to be handled effectively throughout this exchange, a degree of GIS functionality must be provided at the applicant/association level, not just browse capability of the database. When anomalies are detected (or applicant information recorded) this must be returned to the central management facility in an efficient manner.

3.2.2. Making GIS data available in digital form – using for example internet technology – means they can be used by the most technically-advanced 5 to 10% of farmers who have computer systems capable of managing their cropping plans.

- However, it is clearly identified in the regulations that the reliance by other farmers on more analogue approaches should not be prejudiced, in terms of receipt of payments, etc.
- In addition, there should be no difference in the level of control undertaken on applications made with digital or analogue approaches: both must be equally likely to be controlled or selected via risk analysis, and the administrative checks applied should be of equal efficiency.

LPIS Creation and Use: Management and data distribution		Date to be implemented	Amendment proposed
<i>Interface with farmers: delivery of data to a distributed source</i>			
3.2.1	The provision of GIS (and alphanumeric) data should be of a high standard; this is a requirement particularly during the initial creation of the LPIS	First contact with farmers for GIS implementation	No
3.2.1	The data should also be up to date to allow reliable identification	First contact with farmers for GIS implementation	No
3.2.1	Resolution of anomalies must be efficiently handled	2005 application year	No
<i>Degree of GIS functionality must be provided at the administration or association level</i>			
3.2.2	Reference parcel management (at least proposal/edit)	First contact with farmers for GIS implementation	No
3.2.2	Document production facilities	First contact with farmers for GIS implementation	No
<i>Electronic submissions; internet technology</i>			
3.2.2	reliance by other farmers on more analogue approaches should not be prejudiced, in terms of receipt of payments	2005 application year	No
3.2.2	no difference in the level of control undertaken on applications made with digital or analogue approaches	2005 application year	No

3.3. LPIS updating

3.3.1. Difficulties related to location of reference parcels become more pronounced when the available maps are old, or when the agricultural parcels to be declared no longer match the reference parcels used to locate them. This is often the case with parcels as defined in a fiscal land register (cadastre).

- A clear strategy must be developed (by 2005) for the procedure to be used for updating the LPIS. These procedures must be in accordance with the general principles for the management of modifications to aid applications (with respect to relevant dates, deadlines for application or notification, etc) and should be in place and implemented for use during the 2005 application campaign.
- Reg. 3508/92 requires that computerized data relating to at least the previous three consecutive calendar or marketing years are available for direct and immediate consultation; the GIS data are considered part of this.
- The reference parcel should have been reliably validated against external information (topographic mapping, photo interpretation on orthophotos, information exchange and field check with farmer, on the spot visits) and – following this validation – the information on the area of the reference parcel

should be provided to the farmer, to further reduce dependency on tolerances and anomalies related to areas. This validation should take place by the time of distribution of this information in preparation for 2005 applications.

- An assessment of the **currency** of the reference parcels should be made, after the 2004 application year, to determine if the LPIS creation successfully **reflects the farming system** in terms of the accuracy of the parcel boundaries stored in the GIS. This can be determined either from a field check (by the MS) of a statistically representative set of parcels, or by an analysis of the returns from the 2004 aid application information concerning anomalies related to reference parcels.

LPIS Creation and Use: Updating		Date to be implemented	Amendment proposed
<i>Handling changes from farmers</i>			
3.3.1	Annual assessment made to determine if the LPIS creation successfully reflects the farming system	after the 2004 application year	Yes
3.3.1	A strategy must be defined for the procedure to be used for updating the LPIS	In place by 2005 application year	No
3.3.1	Changes to GIS should be tracked for no less than 3 previous consecutive years	First use of system, no later than 2005 application year	No (already in 3508/92, Art 3.2)

4. **Internal checks, including cross checks and eligibility**

4.1. **Speeding up administrative checks / lowering costs:**

4.1.1. Eliminating a large number of errors at the declaration stage provides various advantages for the processing of dossiers, primarily by lowering the rate of irregularities detected by centralised administrative checks, and thus the resulting number of further contacts between applicants and the administrators concerned for dossiers not specifically targeted for on-the-spot checks.

- The approach adopted, resting on the use of GIS for reference parcel checks, should rapidly and unambiguously identify the possible cause of anomalies, using programmed logical analysis and automated reporting.
- Early detection of anomalies related to reference parcels – ideally in real-time at data entry (and not “off-line” or at milestone dates, for example monthly) should be implemented.
 - In the case of electronic systems used for aid application either directly by the farmer or in association with farmers’ organisations, this checking should immediately be indicated, to permit certain cases of anomalies (for example, non-existence of a reference parcel) to be resolved while the applicant is immediately available to clarify the issue.
- The level of workload shifted to a local level (or professional association) will be assessed and the degree of GIS functionality should be commensurate with the responsibility placed at that level. For example, when anomalies with the area of the agricultural parcel declared are identified (with

respect to the area of the reference parcel), the maximum area should be accessible to ensure that the issue can be resolved directly with the applicant.

4.1.2. Decisions on the remaining irregularities identified in administrative checks can be made more quickly where the LPIS is used effectively, without necessarily requiring an on-the-spot check.

- The declared area should be compared with the reference area of the GIS.
- The processing of dossiers at the administration management level that are not subject to on-the-spot checks should be highly automated, and make use of an automated reporting system. Anomalies should be automatically categorised by the system and permit the prioritisation of dossiers for examination and/or the leading to different control procedures.
- Anomalies relating to the LPIS should be visualised on screen and/or the graphical part of the system should be used in the preparation of anomaly reporting (preferably on-line via a computer terminal or networked PC).

Internal checks		Date to be implemented	Amendment proposed
<i>Speeding up administrative checks / lowering costs</i>			
4.1.1	Anomalies should be automatically classed by the system and permit the prioritisation of dossiers for examination	First year of use, no later than 2005 application year	Yes
4.1.1	Anomalies relating to the LPIS should be able to visualised on screen and/or the graphical part of the system should be used in the preparation of anomaly reporting (tracking)	First return of LPIS creation data	Yes
4.1.1	Identification of cause of anomalies	First return of LPIS creation data	Yes
4.1.2	The declared area should be compared with the reference area of the GIS	First year of use, no later than 2005 application year	No, already covered
4.1.2	Processing of dossiers at the administration management level should make use of an automated reporting system (tracking)	First year of use, no later than 2005 application year	No
4.1.1	Workload shifted to a local level commensurate with strategy	First contact with farmers for GIS implementation	No

4.1.3. Since a major difficulty in the use of a purely alphanumeric system is the execution of the agricultural parcel cross check with respect to efficiency, resolution and cost, the use of GIS is expected to significantly enhance this aspect of the area aid control.

- The geographical control, with respect to the definitions of eligible areas for various subsidies (eligibility as arable land Less Favoured Areas, or yield regions, for example) should be undertaken. The definition of the eligible zones may be kept in a different “layer” in the GIS, for comparison with the parcels declared.

- Considering that other geographic constraints are placed upon aid applications, queries could be formulated and conducted on the GIS database; for example, percentage of holding inside regional/member state boundaries.

Internal checks		Date to be implemented	Amendment proposed
<i>Improving eligibility</i>			
4.1.3	Geographical control, with respect to the definitions of eligible areas for various measures defined in 1593/00	First year of use, no later than 2005 application year	Yes
4.1.3	Cross compliance, in particular concerning agricultural parcel reference with other schemes required to be compatible with IACS	For GIS, first year of use, no later than 2005 application year	Yes

4.1.4. The reference system used for the agricultural parcel application process must be regularly and systematically updated with respect to the **eligibility** of all data. In particular, the identification of land cover change involving non-agricultural, wooded, built-up or non-arable areas must be carried out effectively and the GIS updated. Where use of orthophotos is made, the process relies on a) the use of up to date imagery, and b) their correct interpretation and use. If the GIS data are derived from an external source (digital topographic mapping, cadastre) then this too must assure currency and accuracy of eligibility with respect to IACS. This assessment should ensure that the system does not incorporate any ineligible areas greater than 0.1ha in the reference parcels.

- This assessment should be completed for all parcels **before** the preparation for the 2005 application campaign, and should be systematic for all subsequent changes to the LPIS layer.
- The vector parcel (agricultural or reference) information must accurately reflect the limits that can be interpreted from the reference layer, whether this is an orthophoto/image or an external non-image source (e.g., topographic mapping).

Internal checks		Date to be implemented	Amendment proposed
<i>Systematic evaluation of eligibility of reference system used for the agricultural parcel application process</i>			
4.1.4	Exclusion of non eligible areas ≥ 0.1 ha in referenced areas	Year of consolidation, no later than 2004	Yes
4.1.4	The vector parcel (agricultural or reference) information must accurately reflect the limits (within the specifications of the mapping, not smaller than 1:10,000 scale) that can be interpreted from the reference layer.	First year of use, no later than 2005 application year	Not required, already defined in 3508/92

4.1.5. The system should provide a means of ensuring that “undue multiple granting of aid” is prevented (2419/01 Art 16 (a)). This function will typically concern the management of the creation and updating of the reference parcels.

- The procedure implemented in the GIS should ensure 100% control to ensure that no area of land is referenced twice in the system. Again, this should be completed before the 2005 application campaign, but is probably a function that must be implemented at an early stage.
- Detected anomalies in the reference parcels should be visualised and the cause of the problem analysed with operator interaction with the LPIS GIS layer (and orthophoto coverage if existing).
- Reference parcel updating procedures should be efficient and not cause the undue blocking of the applications related to them; however, they must be handled out of phase with the aid application process (see 3.3).

Internal checks	Date to be implemented	Amendment proposed
<i>The system should provide a means of ensuring that “undue multiple granting of aid” is prevented (2419/01 Art 16 (a))</i>		
4.1.5, 3.1.4 The procedure implemented in the GIS should ensure 100% control to ensure that no area of land is referenced twice in the system.	First contact with farmers for GIS implementation	No covered by 2419/01
4.1.5, 4.1.1 Detected anomalies in the reference parcels should be visualised and the cause of the problem analysed with operator interaction with the LPIS	First contact with farmers for GIS implementation	No covered by 2419/01
4.1.5, 3.3.1 Reference parcel updating procedures should be efficient and not cause the undue blocking of the applications related to them; handled out of phase with aid applications	First year of use, no later than 2005 application year	No covered by 2419/01

4.2. Reg. 1257/99: Agri-environment, forestry, less favoured areas and areas with environmental restrictions

4.2.1. The future inclusion of other area aid related controls is covered by a specific technical requirement that any GIS used for the management of these (external areas) including those covered by 495/01, must be compatible with the system put in place for IACS.

5. On-the-spot checks, including controls with remote sensing

5.1.1. In the office, on-the-spot checks need to be prepared by selecting the areas to be measured, grouping and/or subdividing the parcels declared with reference to the identification system, and arranging visit itineraries as efficiently as possible so as to cover one or more holdings.

- The data must be available for use during the on the spot control campaign from their first official GIS use.

- The direct – preferably in digital form – consultation of the GIS data (including where applicable orthophotos) shall be possible for the preparation of field controls for the 2005 application year. Ancillary tools, such as on-screen area measurement tools, route planning tools, access to topographic maps, should also be evaluated.

5.1.2. When performing either conventional on-the-spot or remote-sensing checks, survey officers should have all the documentation needed to do the job properly from the outset.

- The access to data from the GIS on field computers.
- The output from the control exercise should be efficiently implemented in the management of any consequent on-the-spot checks that need to be made.

5.1.3. A clearly documented and/or non-proprietary interface to the IACS GIS should be implemented for the control exercise.

- The reference parcel vector layer and the associated alphanumeric application data must be directly exploited by the body (administration, contractor) responsible for executing these controls.
- While the data used in such an exercise may not be available for 100% of the LPIS before 2005, a specification should be devised at an early stage of the LPIS development (probably 2003, not later than 2004).
- The GIS should include consistent transaction monitoring during the application and control process also for graphical objects. Conceptually, this requires time stamping and operator identification for all operations applied to graphical objects.

On-the-spot checks		Date to be implemented	Amendment proposed
<i>Preparation, standard OTS control</i>			
5.1.1	Ancillary tools, such as on-screen area measurement tools, available	First year of use, no later than 2005 application year	Yes
5.1.1	GIS data used same season for controls	First year of use, no later than 2005 application year	Yes
5.1.2	The direct use in digital form on portable computers of the consultation of the GIS data (including where applicable orthophotos) should be in place	First year of use, no later than 2005 application year	Yes
5.1.2	The output from the control exercise should be implemented in the management of any consequent on-the-spot checks that need to be made	First year of use, no later than 2005 application year	Yes
5.1.3	The reference parcel vector layer and the associated alphanumeric application data must be directly used by the body (administration, contractor) responsible for executing these (including RS) controls.	First year of use, no later than 2005 application year	Yes
5.1.3	Clearly documented interface to the IACS GIS data should be implemented	First year of use, no later than 2005 application year	Yes
5.1.3	Transaction monitoring required for GIS database	First year of use, no later than 2005 application year	Yes

(end of document)