ENABLING ACCESS TO SPATIAL INFORMATION FOR INFORMED DECISION-MAKING: A CASE STUDY OF THE STRUCTURE PLAN FOR MINING.

Selwyn W. WILLOUGHBY, South Africa

Key words: spatial information, spatial planning, GIS, Internet, structure plan for mining.

ABSTRACT

The collection of accurate and relevant spatial information, for spatial planning purposes is of critical importance to assist in well-informed decision-making. The true value of collected information will only be achieved when the information is shared. The proper dissemination of information can ensure that spatial information contributes towards sustainable development. The paper discusses the Structure Plan for Mining and the method of disseminating information to ensure rational decision-making.

INTRODUCTION

In January 1999 the former Cape Metropolitan Council, now part of the City of Cape Town, initiated a structure Plan for Mining. The plan deals with mineral resource extraction and contains policies and guidelines to provide a framework for decision-making in respect of the applications for land-use changes. The primary objective of the Structure Plan for Mining is to facilitate decision-making in regard to the appropriate long-term use of land. However the overall goal of improving or maintaining the quality of life of the inhabitants of the area remains the primary concern.

The study area included the then six Metropolitan Local Councils as well as two District Councils. The challenge was to ensure that the information is used across the study area and applied consistently. This paper outlines the Structure Plan for Mining and the method for ensuring that the spatial information generated by the study, contributes toward sustainable spatial planning practices.

THE STRUCTURE PLAN FOR MINING – AN OVERVIEW

The planning process that the Structure Plan followed includes technical studies, a public participation process leading to goals and objectives, which informed the policy and management proposals. The proposals and recommendations of the plan include land-use change policy recommendations for the identification and delineation of where mining should not be permitted, as well as areas where mining should be given priority. These management guidelines focus on the potential impact of mining on the environment and do not address operational and technical aspects of mining.

The major inputs for the study came from town planners, geology/soil experts, environmentalists/botanists and public participation facilitators.

Study Area

It is important to note that because the study area was considered purely on practical considerations and not on a detailed or scientific study, it is wider than the City of Cape Town jurisdictional area. Topography, particularly mountain ranges, which influences transportation cost and distance from the Cape Metropolitan Region, were some of the criteria considered when delineating the area. The study area stretches westwards from the Hottentots Holland - Franschhoek - Drakenstein - Elandskloof mountain chains, southwards from an east-west line to the north of the town of Darling and Riebeeck Kasteel, to the Atlantic and False Bay coasts respectively (Figure 1).

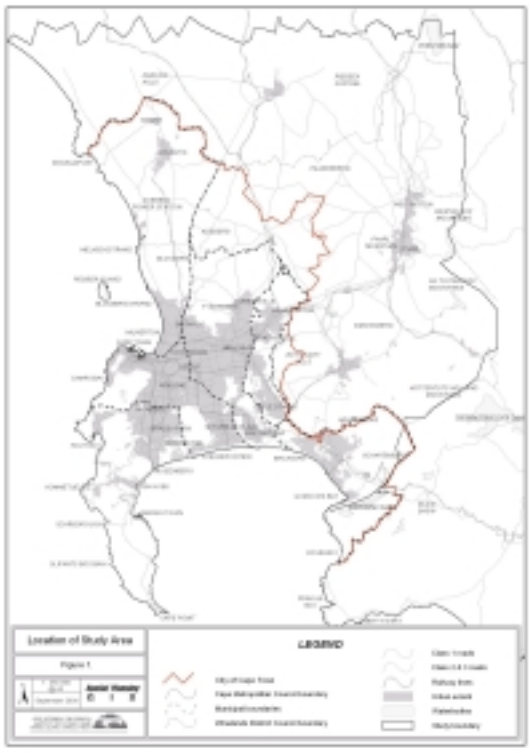


Figure 1 Study Area

Spatial Planning and Mineral Extraction

Various structure plans and spatial development frameworks have been, or are in the process of being prepared for the study area. It is recommended that the findings of the Structure Plan for Mining be incorporated into other spatial planning frameworks where applicable. One such plan is the draft Metropolitan Spatial Development Framework (MSDF), which aims to "guide the form and location of physical development in the Cape Metropolitan Region on a metropolitan scale. The framework is based on a defined vision of a well managed, integrated, metropolitan region, in which development is intensified integrated and sprawl contained" (CMC 1996, ix). The draft MSDF Technical Report state that mineral planning must be incorporated into the overall development framework for the Cape Metropolitan Region. It further states that undeveloped areas with mineral deposits of economic value should not be developed.

The Draft Statutory MSDF includes the following policies relevant to mining;

- Integrated Environmental Management procedures, or similar methodologies, as required by the Environmental Conservation Act should be part of development proposals for any environmental and economic resource,
- All Local Authorities should ensure that compatible strategies are perused when dealing with mineral or extractive resources/rights, and existing and future land-use development or conservation requirements for the area.
- Disused mineral works and quarries can contribute to the Metropolitan Open Space System
- The Urban Edge, the line beyond which no urban development should not be permitted, aims to make optimal use of natural resources, and though not explicitly stated would include mineral deposits. Economic mineral deposits may be used to assist in the delineation of an urban edge.

The spatial information on vegetation and mineral resources are thus important informants in forward and reactive planning practices.

Spatial Information

Access to, and the capturing of spatial information is central to this structure plan. Therefore it was important for the various specialists to have access to the latest information to aid in identifying the scope for capturing new data. To achieve the desired results all information was captured to a common base provided by the Corporate GIS Department. The mineral and environmental resources spatial databases were created for this study. This information was incorporated with existing spatial and non-spatial information.

Geological Assessment

The mapping of mineral resources was done by means of aerial photo interpretation. This technique improved the accuracy of previously captured data. The edited and new data was captured through a system of mapping units that are relative homogenous geological and mineral areas.

The result of the geological/soil investigation is a 1: 10 000 digital map listing all available mineral resources (figure 2). The database contains the following additional information,

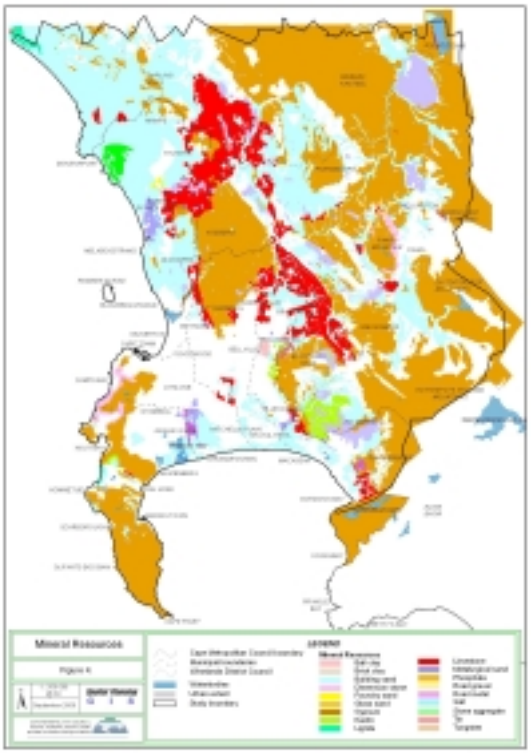


Figure 2 Mineral Resources

- The geological condition,
- The occurrence of the mineral,
- The relative importance of the mineral,
- The economic potential of the resource over time,
- The method of excavation,
- The physical end-result of mining,
- The presence of a water table, and
- The occurrence of a secondary mineral deposit.

Through the geological assessment, the most important building and construction materials were identified. Furthermore, it was found that larger quantities of silica (glass) sand exist than previously known. The findings provide an opportunity for land-use change decisions to consider the importance of the mineral deposits as well as the feasibility of successful post-mining rehabilitation.

Environmental Investigation

The aim of the environmental investigation is to provide an overview of the general ecology and conservation status of the area, focussing on the natural plant life, particularly in relation to the soil and habitat types. Furthermore, the investigation rated the various ecosystems and vegetation formations on the basis of conservation importance. The study concludes with guidelines for mining, from an environmental perspective.

The spatial database of the original distribution of vegetation was constructed using existing data, a correlation between geology/soils and vegetation and rainfall (figure 3). A database containing the remnant vegetation (for areas where the possibility for mining exits) was constructed and includes the following information (figure 4);
- The vegetation sub-region,
- Vegetation category,
- Present conservation status,
- Potential conservation status,
- Other occurrences of the vegetation,
- Confidence in future conservation,
- Likely qualitative and quantitative impact of mining.

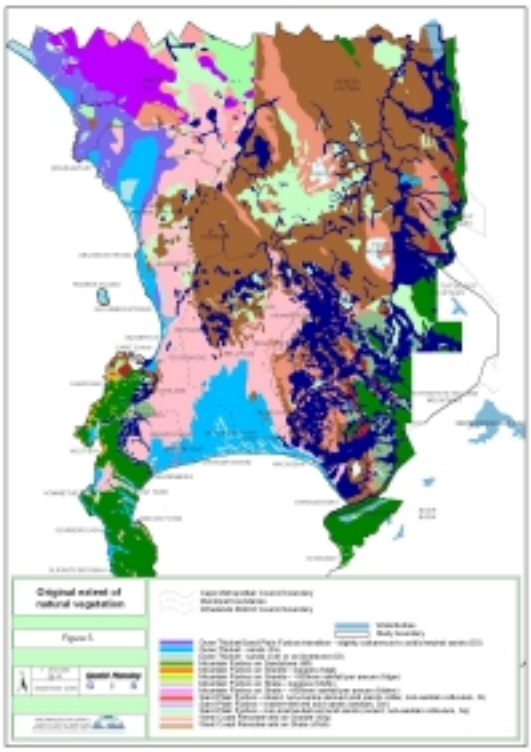


Figure 3 Distribution of the original vegetation

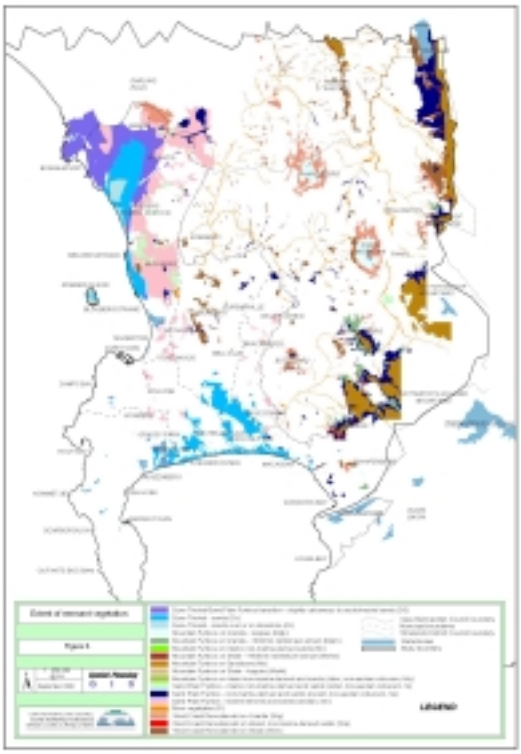


Figure 4 Distribution of remaining original vegetation

The environmental investigation found that 29% of original vegetation remains (excluding the Cape Peninsula National Park) and only 16.2% is of good quality.

The conservation assessment concludes with the recommendation that the findings be incorporated into other spatial plans and identifies vegetation types that should not be disturbed. Thus, the recommendation is that where high conservation worthy vegetation occurs mining should not be permitted.

SUSTAINABLE MINING PRACTICES

The term, sustainable development, has become a catch phrase because its generic definition can be applied to many disciplines which concerns itself with quality of life. To make the term more meaningful, it must be defined within the area of application to ensure that it is not a hollow catch phrase. Even for the purpose of spatial planning, it would be difficult to articulate what sustainable development should mean for the discipline, and therefore defining the term will be done in the context of what this structure plan aims to achieve.

Thus, sustainable practices within the Structure Plan for Mining aims to ensure that bio-diversity is maintained, while contributing to the economy of the Western Cape, and that mining practices are in line with international commitments, such as Agenda 21. Not being able to quantify the cost of the mineral deposits, the environmental resources society, the

final decision for finding a balance between mining activities and the environment rest with political decision-makers. For informed political decisions to be made, the dissemination of the collected spatial information is of critical importance. An information dissemination strategy has been developed to ensure that the information reaches its target audience.

DISSEMINATION OF SPATIAL INFORMATION

At the time of the study, Cape Town had six Metropolitan Local Councils, each with its own political autonomy. In the absence of a comprehensive database of mineral and vegetation resources and a framework for mining, each Local Council applied its own rules to approving applications for mining. As a result the collective impact of mining across the City could not be established. To ensure that the results of this study inform land-use change decisions, the information had to be disseminated to all the Local Councils.

Compact Disc

The first version of the structure plan for mining decision support information was written to a Compact Disc (CD). The CD contained the spatial information, the full report, the executive summary, as well as GIS viewer, ArcExplorer, and the accompanying help files. The spatial information was captured in Shapefile format and predefined views were set-up for ease of use. The CD was distributed to all officials throughout the study area.

The feedback from the officials was that not everyone had access to a CD-ROM. Although the spatial data was prepared for viewing, not everybody who did have access knew how to effectively use information contained on the disc. Most of the users found it difficult to relate the spatial information to written report.

Internet

An informal survey found that more officials had access to the Internet than to CD-ROMs, thus the alternative was to disseminate the information via the Internet. The Internet provided the perfect medium to reach a large audience with minimal or no investment in additional software, hardware or training. The major challenge with developing the decision support website, was to develop user-friendly web pages. Proving access to spatial information over the Internet was the first such challenge for the Spatial Planning Department.

Unlike the CD-ROM, developing web pages for the Internet provided the opportunity to add additional functionality to the Structure Plan for Mining information. The web site was developed to act as a decision support website because it provides more functionality at a fraction of the cost than of a CD-ROM. The structure of the web site ensures easy navigation and contains links for reading the full report, viewing all the maps in an image format, downloading all the information, including a mapping (GIS) component, and the most important, the site assessment page.

Re-organisation of spatial databases

To overcome the problem of not being able to relate the spatial information to the report, the spatial databases were re-organised and updated. The most important tables in the report were added to the spatial databases. Where tables and figures could not be added, reference was made to those particular sections in the report. All relevant chapters and sections are also referred to. Thus, for each of the vegetation and mineral resources records in the databases, reference has been made to all relevant sections, graphs, tables and chapters in the hardcopy report.

Site Assessment

The website contains volumes of information, and to ensure that the user is guided through the spatial information, an assessment procedure was developed. The aim of the assessment procedure is to assist a user when assessing the land-use change application for a particular site. The user will be guided through a five phased approach while accumulating all relevant information for the particular site.

Before an assessment can be performed the user must identify the erf unit by means of the erf number. The user then goes onto a five-phase assessment procedure. The first phase assesses the presence of mineral deposits and whether it is a high priority mineral deposit. The second phase assess whether the erf falls within a proclaimed conservation area, and the third assess whether remnant vegetation occurs above the deposit. The fourth phase assesses the agricultural potential of the site and the final phase allows for general comment to be entered. The assessment procedure culminates with a report in which all the above information for the specific erf is listed. The user is also prompted to enter contact information. The report with maps can be printed and attached to the application with the official decision (Appendix A).

Data Maintenance

The advantage of using the Internet is that all assessments are logged. The logged assessments can then be accessed and analysed. This feature provides the opportunity to assess the geographical extent of the applications, as well as the mineral resource that is potentially being mined. This information can act as a catalyst for new research, should any trends of concern become visible. The only shortcoming of the decision support web site is that at the time of assessment no approval is granted, and therefore follow-up work needs to be carried out. The follow-up work is made easy by using the contact information on assessment page. Once all this information is collected, the spatial databases can be updated.

The site also allows for feedback on any of the information held with in the database. Part of the feedback comment is the erf number which allows the GIS Specialist to accurately identify the geographical extent of the potentially inaccurate information. After verifying the feedback, the information will be corrected. This mechanism allows for the site to

automatically maintain its datasets, and thus eliminate the need for expensive follow-up surveys of the spatial data.

Public access to the information does not necessarily mean that all minerals are open to be mined. Public access to the information is beneficial to the officials, as the potential of a successful application can be assessed before submitting it to Council for approval.

CONCLUSION

The accuracy of spatial information has increased over the last decade resulting in greater user confidence. Also, the continual improvement of the technology employed with spatial information ensures that the information can be applied to assist in rational decision-making. The problem that is generally encountered is the reluctance of making information available. To ensure that spatial information contributes to sustainable spatial planning practices, information sharing is critical. Therefore, the dissemination of information is an important criterion in realising the aim of the Structure Plan for Mining, and publishing the information to a website ensures that consistent well-informed decisions regarding mining is made throughout the study area.

The publication of the Structure Plan for Mining website promotes the City of Cape Town's strategic pledge of creating a smart city. It also promotes the goals of the Promotion of Access to Information Act (Act 2 of 2000) as well as the Green Paper on Preparing the Western Cape for the Knowledge Economy of the 21st Century.

REFERENCES

Cape Metropolitan Council, 1996. Metropolitan Spatial Development Framework. Technical Report.

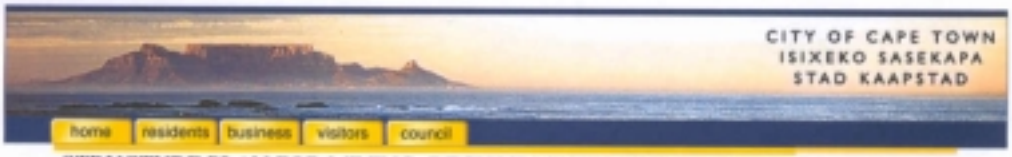
Cape Metropolitan Council, 2000. Structure Plan for Mining. Volume 1.

Yeh, A, G-O, 1999. Urban Applications in GIS. Geographical Information Systems, Volume 1. Ed Longley et al. John Wiley & Sons Inc. New York.

CONTACTS

Selwyn W. Willoughby
City of Cape Town
Cape Metropolitan Council Administration
Cape Town
SOUTH AFRICA
Tel. + 27 21 487 2229
Fax + 27 21 487 2750
Email: swilloughby@cmc.gov.za
Web Site: http://www.capetown.gov.za

APPENDIX A



STRUCTURE PLAN FOR MINING: DECISION SUPPORT WEB SITE

Site Map
Welcome
Report
Mapping
Downloads
Site Assessment
Ass. Functions
Search for a property
Feedback on a property
Ass. Phases
Phase 1
Phase 2
Phase 3
Phase 4
Phase 5
Ass. Results
Contact Us

The recommendations are based on a regional perspective derived from the area-wide data collected for this study. In the final analysis, decision-makers will need to decide on a case-by-case basis whether other information arising out of an EIA can justify decisions that are not consistent with these broad recommendations.

ASSESSMENT RESULTS FOR PROPERTY:
C01600000000114100000

Compiled by: S Willoughby
Contact number: 487 2229
Email: swilloughby@cmc.gov.za
Organisation: City of Cape Town

PHASE ONE: MINERAL RESOURCES

(See Fig. 4, Table 1 and Ch. 10 in the report)

Priority of the mineral deposit(s): Building sand - 1640 other deposits	[Resource_1]
Economic importance: Minimal/ low - see Table 1.	[Econ_imp_1]
Resource status: Potential for mining	[Res_status]
Excavation method: Pit - see Table 1.	[Exc_method]
Excavation depth: Shallow	[Exc_depth]
Mine floor depth: Below	[Floor_wt]
Degree of disturbance: moderate	[Disrup_rtg]
Dev. pot. after mining: low	[Dev_rating]
Rehabilitation required: Very high - see Table 1.	[Rehab_req]
Secondary resource: None	[Resource 2]
Sec. eco. importance: Nil	[Econ_imp_2]

PHASE TWO: CONSERVATION AREAS

(See Figure 7 and Table 4 in the report)

Conservation Areas within an area of significance: Nature

PHASE THREE: REMNANT VEGETATION
(See Figures 7, 8.1, 8.2, 8.3 and 9)

Vegetation type:	Sand Plain Fynbos - on marine derived acids sands (Sm)	[Gen_desrc]
Vegetation grade:	Vegetation grade 1 - minimal alien infestation	[Veggrade]
Conservation Importance:	High - see Table 6	[CONS_IMP]
Conservation Rariry:	Fairly abundant - see Table 6	[RARITY]
Conservation status:	1.05 Percent - see Table 3	[Cons_status]
Percentage of veg. lost:	50	[Z_lost]
Sub-regions vegetation:	WCAZ1 - see Table 4	[vegsubreg]

PHASE FOUR: AGRICULTURAL POTENTIAL
(See Figure 9 in the report)

Agricultural potential: High [agric_pot]

PHASE FIVE: COMMENTS
0

Print Report
Back to Assessment

To print a map of a certain phase - Press the print map button on the section of that phase.