

CSIRO Operational Plan

2002-03



CSIRO

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**CSIRO
OPERATIONAL PLAN**

2002-03

**The Commonwealth Scientific and
Industrial Research Organisation (CSIRO)
is an independent statutory authority constituted
and operating under the provisions of the
Science and Industry Research Act 1949.**

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Telephone 1300 363 400

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Foreword

This CSIRO Operational Plan sketches a picture of the diverse activities and achievements to be pursued by the Organisation in 2002-03, which is the last year of the current funding triennium. Our purpose provides a common thread through this diversity –

By igniting the creative spirit of our people, we deliver great science and innovative solutions for industry, science and the environment.

Our commitment is to apply the highest standards of scientific endeavour to finding solutions to current and emerging problems, and to building new opportunities for the future. In this way we will ensure that science and technology continues to play its vital role in meeting the needs and aspirations of Australians, whether they be of an economic, social or environmental nature.

The Corporate Overview section of this Operational Plan incorporates significant components of CSIRO's most recent Strategic Action Plan, setting out the Organisation-wide strategic priorities and key actions for the year ahead. This is supported by individual entries for each of our research Divisions, summarising the specific focus and strategies of each Division and providing a selection of specific planned achievements for the year ahead.

The Plan also provides an overview of the allocation of resources between CSIRO's research-performing Divisions and how these resources are applied to serve the various sectors of Australian life represented by CSIRO's Sector Advisory Councils.

I commend the Plan to all staff and to other interested stakeholders.

Dr Geoff Garrett
Chief Executive

Organisational Chart

Ministers

Education, Science and Training - The Honourable Dr Brendan Nelson MP
Science - The Honourable Peter McGauran MP

CSIRO Board⁽¹⁾

Ms Catherine Livingstone (Chairman)
Professor Suzanne Cory - Dr Terry Cutler - Mr Peter Duncan
Dr Geoff Garrett - Mr Donald McDonald - Mr Don Mercer
Professor Vicki Sara - Dr Peter Shergold - Dr Ed Tweddell

Executive Team

Dr Geoff Garrett - Mr Mehrdad Baghai - Dr Vijoleta Braach-Maksytyis -
Dr Ted Cain - Dr Michael Eyles - Dr Graham Harris - Dr Rod Hill -
Dr Bruce Hobbs - Ms Di Jay - Dr Warren King - Dr Steve Morton -
Mr Peter O'Keefe - Dr Ron Sandland - Mr Mike Whelan

Executive Management Council⁽²⁾

Agri-food & Fibre Group

Food Science Australia⁽³⁾ -
Forestry & Forest Products -
Health Sciences & Nutrition -
Livestock Industries -
Plant Industry -

Environment & Natural Resources Group

Atmospheric Research -
Entomology -
Land & Water -
Marine Research -
Sustainable Ecosystems -

Sustainable Minerals & Energy Group

Energy Technology -
Exploration & Mining -
Minerals -
Petroleum Resources -

IT, Manufacturing & Services Group

- Australia Telescope National Facility
- Manufacturing & Infrastructure Technology
- Mathematical & Information Sciences
- Molecular Science
- Telecommunications & Industrial Physics
- Textile & Fibre Technology

CSIRO-wide Support

- Business Development & Commercialisation
- Communications
- Finance & Property Management
- Flagship Programs (BHAGs)
- Information Technology/e-CSIRO
- People Development
- Risk Management
- Science Planning

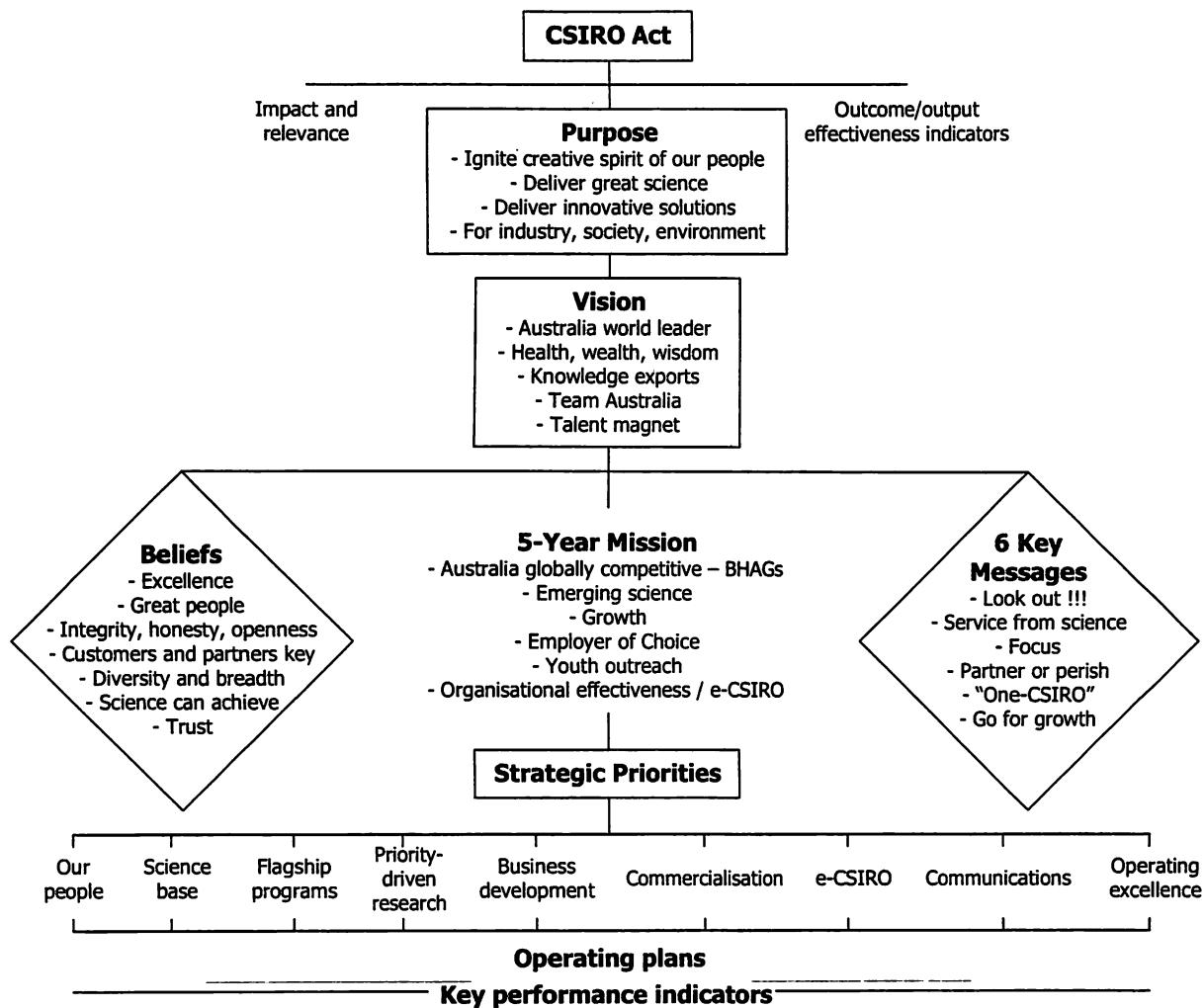
CSIRO Science Forum

(1) Board and Executive Team as at 1 September 2002.

(2) The Executive Management Council comprises members of the Executive Team and all Divisional Chiefs. See pages 92-94 for contact details.

(3) Joint venture with the Australian Food Industry Science Centre (Afisc).

CSIRO's Strategic Framework



This diagram depicts the relationship between the elements of CSIRO's planning framework and the Act of Parliament that establishes CSIRO as a statutory body. While the *value* of CSIRO's existence is demonstrated to Government via measures of impact, relevance and outcome/output effectiveness, the *reason* why CSIRO exists is captured by our Purpose.

Our Vision describes where that Purpose will lead us and, to provide more concrete goals, our 5-Year Mission articulates some specific objectives. In achieving these, our thoughts and actions will be guided by Six Key Messages.

Our Beliefs capture what we stand for, as CSIRO staff. As we move towards achieving our Vision, we focus our efforts on our Strategic Priorities. The Actions that address these Priorities are detailed in our Strategic Action Plan and supported by a suite of performance indicators to measure the impact and success of our Actions.

The Key Actions and Headline Indicators are included in the Corporate Overview section of this CSIRO Operational Plan.

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CSIRO's FUNCTIONS

The Commonwealth Scientific and Industrial Research Organisation's (CSIRO's) primary functions (*Science and Industry Research Act 1949*, Section 9) are:

- to carry out scientific research for the purpose of assisting Australian industry, furthering the interests of the Australian community, contributing to the achievement of national objectives or the performance of national and international responsibilities;
- to encourage or facilitate the application or utilisation of the results of scientific research; and
- to carry out services, and make available facilities, in relation to science.

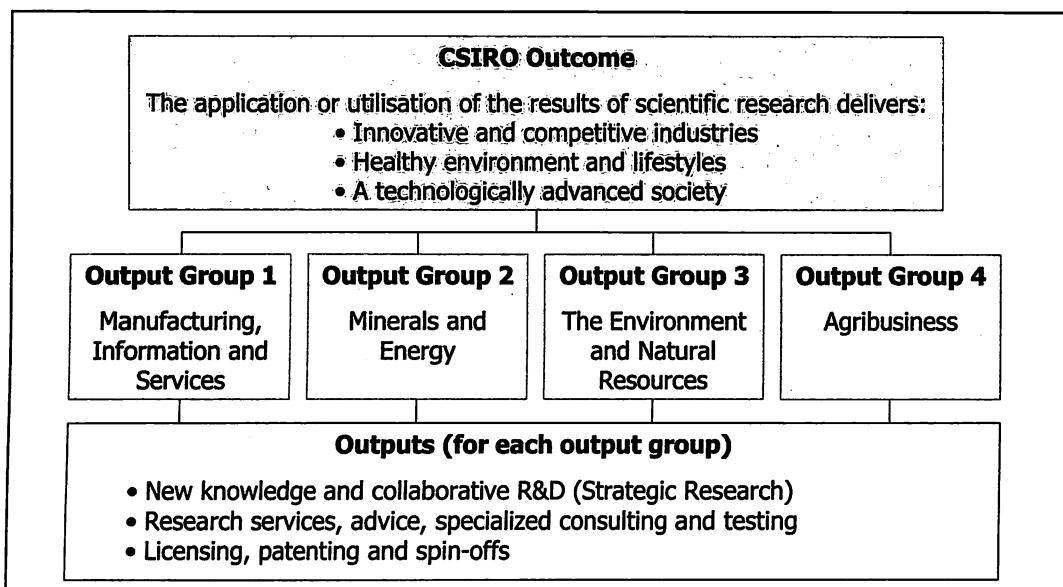
Secondary functions specified in the Act include functions in relation to:

- liaison with other countries in matters connected with scientific research;
- training of research workers;
- standards of measurement;
- collection, interpretation and dissemination of information on scientific and technical matters; and
- publication of scientific and technical reports, periodicals and papers.

CSIRO's OUTCOMES AND OUTPUTS

CSIRO has reviewed its outcome-output framework for 2002-03 to more clearly articulate the nature of CSIRO's contribution to the nation through the application of research results, and to facilitate improved reporting of CSIRO's performance in so doing. The changes support the implementation of initiatives, set out in CSIRO's Strategic Action Plan, increasing our capability to address major national challenges and global opportunities. The revised outcome-output framework is illustrated in Figure 1.

Figure 1: CSIRO's Outcome-Output Framework



Outcome Description

CSIRO aims to help Australia become a healthy country, for both the environment and its people. We aim to become a land of winning industries, competitive with the world's best, providing better jobs. We aim to become a know-how nation, founded on the discovery, accessibility and wise application of knowledge from Australia and around the world

Corporate Overview

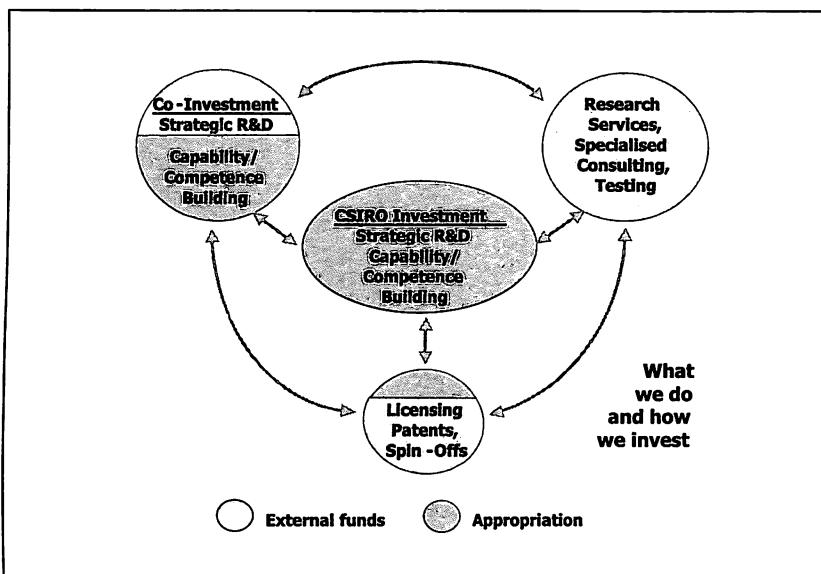
To provide crucial advances in knowledge and facilitate its application, CSIRO conducts world-class research that is directed to strategically important issues identified in consultation with government, industry and community and focussed on returning benefits to Australia. This research is frequently conducted in partnership with others.

Output Groups and Outputs

The four (unchanged) **output groups** are readily aligned with the beneficiaries of CSIRO's activities, with broad areas of government priorities, and with CSIRO's system of stakeholder consultation through Sector Advisory Councils.

The new framework defines three types of **outputs** congruent with the new CSIRO Investment Model (Figure 2). This will facilitate the measurement and pricing of CSIRO's outputs. CSIRO conducts strategic research on matters of national significance (either wholly appropriation funded or with co-investment), provides a range of services to industry, government and the community (at full cost), and exploits its intellectual property through patenting, licensing and new enterprise creation.

Figure 2: CSIRO's Investment Model



CSIRO is currently planning for the next triennium based on the new investment model. The CSIRO Annual Report for 2002-03 will include reporting consistent with the investment model at the output level. Commencing the transition now will enable the investment model to be fully operational for both planning and reporting purposes for the first year of the new triennium in 2003-04.

Delivering National Benefits

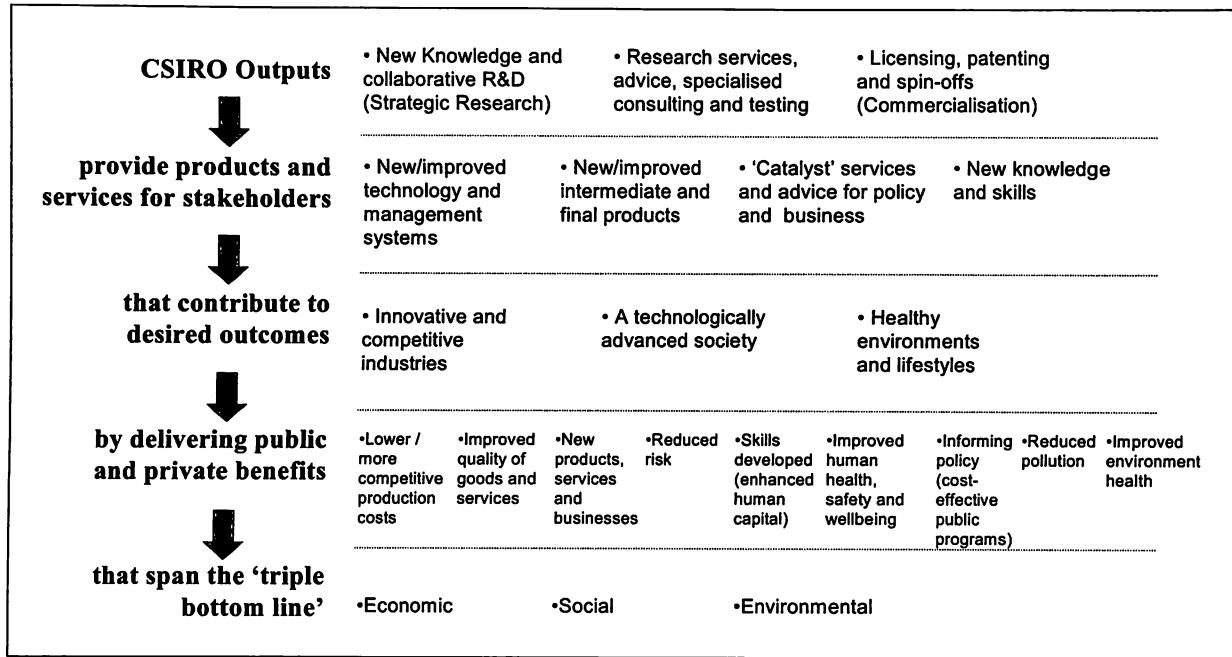
The Government's investment in CSIRO reflects its recognition that Australia requires world-class R&D capabilities to fully participate in, and benefit from, the increasingly knowledge-based global economy. At the same time, many of the issues facing managers of Australia's industries and environment are uniquely Australian and of such a scale that only a dedicated Australian R&D capacity can be expected to meet our requirements. The pathway by which CSIRO's outputs contribute to benefits that span the 'triple bottom line' is illustrated in Figure 3.

The contribution of CSIRO's outputs to the nation is underpinned by:

- strength in multi-disciplinary, systems-oriented research teams;
- advice-rich issue-focussed approach to priority setting and planning ;
- emphasis on astute partnering and developing commercially relevant business practices;
- efforts to sustain a balanced portfolio of near-term and long-sighted R&D;

- efforts to sustain a balanced portfolio of near-term and long-sighted R&D;
- commitment to scientific excellence; and
- responsible stewardship of public trust and investment.

Figure 3: CSIRO's Pathway to the Triple Bottom Line



ORGANISATIONAL PERFORMANCE INDICATORS and EVALUATION

Effectiveness Indicators (Achievement of Outcome)

CSIRO's effectiveness in contributing to desired outcomes across the triple bottom line will be demonstrated with evidence of economic, social and environmental benefits achieved through the adoption and impact of CSIRO research and advice. Specific indicators from project evaluations, stakeholder feedback and commissioned benefit-cost studies will include (as per Figure 3):

- Lower / more competitive production costs
- Improved quality of goods and services
- New products, services and businesses
- Reduced risk
- Development of skills (enhanced human capital)
- Improved human health, safety and wellbeing
- Informing policy (cost-effective public programs)
- Reduced pollution
- Improved environmental health

"Headline" Indicators for Strategic Priority Areas

The proposed "headline" indicators and measures listed below are drawn from a more comprehensive set of measures that has been developed to assist CSIRO in monitoring and managing performance across the nine strategic priority areas identified in our Strategic Action Plan. The Strategic Priority Areas are: Our people, Science base, Flagship programs, Priority driven research, Business development, Commercialisation, e-CSIRO, Communications, and Operating excellence. Specific targets will be set for the indicators marked with an asterisk.

Corporate Overview

Occupational Health and Safety

- OHS positive performance index *
- OHS injury measures (lost time incident, medical treatment and average lost time rates)*

Employer of Choice

- Staff satisfaction index *

Science Excellence

- Citations per publication - average over 5 year window
- Patents: current impact index (US patents only) *

Productivity

- Publications: number by type
- Publications: number of refereed papers per Research Staff member
- Patents: number of patent families @ 30 June
- Patents: number of Patent Cooperation Treaty (PCT) applications @ 30 June
- Startups: number of new companies formed dependent on licensing or assignment of CSIRO technology

Renewal/Training

- Post-doctoral numbers *
- Post-graduate supervision *

***Customer Satisfaction* (CSIRO's own score and comparative value score)**

- Customer rating of overall value *
- Customer rating of product/service
- Customer rating of people/process

Business Development

- External revenue by source
- Revenue by business domain (CSIRO Investment Model)
- Total appropriation revenue
- External earnings ratio

Financial

- Debtors (receivables management) *
- Operating result (after capital use charge)
- Cash balance (excluding Trusts and R&D Syndication money)

e-Performance

- Cisco 'Net Readiness' score *

Operating Performance

- Number of new contracts commenced
- Average value of new contracts
- Projects fulfilled on time %
- Projects fulfilled on budget %

Performance Indicators in the Triennial Funding Agreement

There are six key performance indicators included in CSIRO's current triennial funding agreement with the Government (2000-01 to 2002-03). These are as shown in the following box. There are some indicators in common with the headline indicators listed above. In general the six key performance indicators are defined to apply at the whole-of-CSIRO level. However, where appropriate and feasible, performance information is presented at the output group or output level in the Annual Report. The triennial funding agreement is due to be renegotiated during the course of 2002-03.

1. The CSIRO's shift of resources in line with changing priorities as determined in consultation with Government, Sector Advisory Committees and CSIRO customers in the public and private sectors.
2. The amounts and sources of external earnings for research and related services.
3. The number of patents, reports and other publications annually. Quality assessment through citation analysis on a five-yearly basis.
4. The number of research students supervised or co-supervised by CSIRO staff, reflecting CSIRO's contribution to the development of the skills base of Australia and its own staff.
5. Customer satisfaction (feedback from customer surveys).
6. Adoption and impact of CSIRO outputs - examples of practices, instruments, products and processes developed by CSIRO and adopted by users in industry, government and the community, or changes in user practice in response to policy advice provided by CSIRO.

Systematic Evaluation

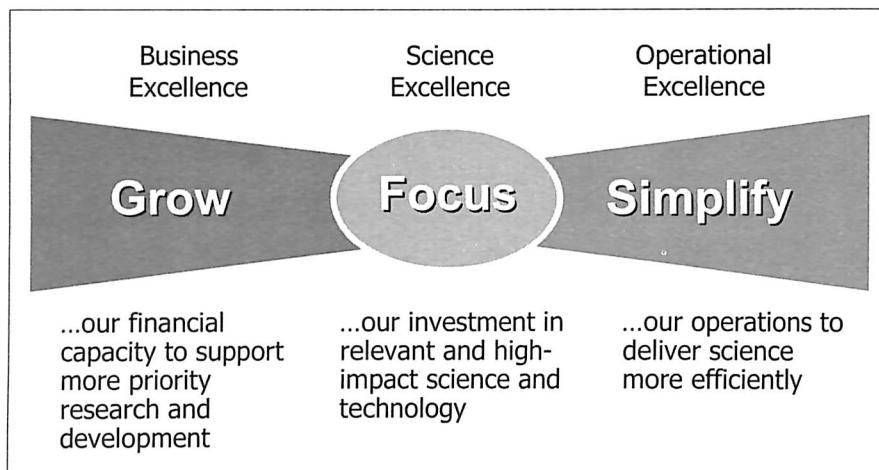
Ongoing, systematic evaluation in CSIRO includes independent assessment by Sector Advisory Committees of CSIRO's performance in addressing identified sector research priorities; periodic review of major areas of activity (Energy and ICT in 2002); the submission of scientific findings to regular critical appraisal by internal and external peers; the critical assessment of patent applications; and the cycle of Staff Annual Performance Assessments (APAs).

STRATEGIC PRIORITY AREAS: KEY OBJECTIVES AND ACTIONS

In May 2001 the Executive Management Council developed a Strategic Action Plan (SAP) to underpin the forging of 'a new CSIRO for a new century' characterised in terms of CSIRO evolving from a 'research institution' to a 'global research enterprise'. Key elements of the plan were presented in CSIRO's Annual Report for 2000-2001.

The SAP - reviewed and revised in November 2001 and again in May 2002 - identifies nine strategic priority areas. The key objectives and key actions for 2002-03 in each of the nine strategic priority areas are described below. The strategic intent that drives these objectives and actions is summarised in Figure 4.

Figure 4: CSIRO's Strategic Intent



Corporate Overview

Our People

CSIRO's success depends first and foremost on our people, whose tacit and explicit knowledge is the source of our creativity and innovation. Increasing competition from local and international R&D labour markets means that our people policies and practices must be world-class to attract and retain the best.

Key Objectives

Maximise our competitive advantage and delivery of quality and value-adding outcomes by:

- Attracting, retaining, rewarding and motivating the right mix of creative, highly skilled, outcome-focused, team-oriented people
- Improving the opportunities for personal and professional development for all our staff.

Key Actions 2002-03 (Coordinating responsibility: Peter O'Keefe)

1. Implement the new OHS&E strategy
2. Enhance performance-based rewards and recognition
3. Enhance annual Staff Poll
4. Trial career development and succession planning for key positions
5. Strengthen leadership capabilities in CSIRO
6. Implement the new People Development Strategy (PDS)
7. Strengthen CSIRO's position as an "employer of choice"
8. Review approach to Learning and Development

Our Science Base

Science is CSIRO's foundation – it is our core business. Thus, it is essential for CSIRO to build, achieve and preserve excellence in the sciences that help us deliver benefit to industry, society and the environment. Excellence demands that CSIRO has the very best people, facilities and partners, as well sufficient critical mass to sustain specific research activities. CSIRO must also have an eye to the future to ensure that opportunities in emerging sciences are captured. The nature of the challenges facing Australia requires solutions spanning scientific disciplines. This is where we must harness CSIRO's competitive advantage – diversity of knowledge.

Key Objectives

- To grow our science base with a clear focus on priority-driven research, Flagship Programs and emerging science.
- To increase our investment in emerging science and technology areas
- To enhance CSIRO's reputation for high quality science and technology
- To capitalise on CSIRO's diversity, recognizing that innovation frequently occurs at the interface of disciplines.

Key Actions 2002-03 (Coordinating responsibility: Vijoleta Braach-Maksytyis)

9. Complete Science Strategic Plan
10. Complete Science Plan for CSIRO Strategic Plan document
11. Review processes for resource allocation
12. Establish process for identifying Emerging Science Areas
13. Establish process for identifying Federation Fellowships
14. Continue relationship building
15. Review Postdoctoral Program
16. Implement CSIRO Science Forum communication plan

Alignment With National Priorities – Flagship Programs (BHAGS)

CSIRO's five-year mission states that "...we will help make Australia a stronger global competitor in the 21st Century through a new set of large projects that will deliver outcomes around:

- Information and communication technologies
- Biotechnology to drive pharmaceutical and agribusiness developments
- Sustainable natural resource management
- Practical solutions to major environmental challenges
- New and transforming manufacturing industries
- New companies to take Australian knowledge products to the world
- Science and technology to help Australians live longer, healthier lives
- Technology to overcome the disadvantages suffered by remote Australia"

These outcomes were to guide the development of BHAGs (Big Hairy Audacious Goals, implemented as Flagship Programs) and serve also to develop "One CSIRO" behaviour and outputs.

Key Objectives

Develop a small number of BHAGs as national (even international) initiatives, 'Team Australia' partnerships to ensure effective delivery; each BHAG to contribute to the growth of CSIRO's business (growing through a mix of CSIRO and other funds). As a first step, define fully the scope, schedule and budget, and develop project plans for a small number of potential BHAGs to enable final decisions to be made, funds invested and the commencement of execution and delivery by early 2002.

Key Actions 2002-03 (Coordinating Responsibility: Graham Harris)

17. Appoint Flagship Directors to at least five Flagship Programs
18. Ensure at least five Flagship Programs funded and work commenced in next financial year
19. Contribute to CSIRO triennial funding proposal
20. Contribute to National Priorities process

Priority Driven Research—Triennium Funding

One of CSIRO's goals is to grow our capabilities to make significant impacts on the challenges and opportunities facing Australia's society, economy and environment over the next 25 years. An important aspect of this goal is CSIRO's relationship and interface with government and, in particular, how government makes and measures returns on investments in CSIRO. The Triennium Funding process is an opportunity to establish a new, clearly defined relationship with government in which the expectations of government are clearly articulated, and in which the measures of the returns on the government's investment in CSIRO are defined in quantifiable ways.

Key Objectives

To develop a new relationship between government and CSIRO, where we move from the present customer/supplier relationship to an investment/performance-based contract (with mutually agreed performance indicators, measures and targets). Consistent with our documented growth strategy, a central objective of this new relationship is a value-for-money, benefit-costed increase in CSIRO's appropriation funding.

Key Actions 2002-03 (Coordinating Responsibility: Bruce Hobbs)

21. Prepare targeted versions of the Australia 2025 report
22. Prepare Preferred Policy Options for select Sectors
23. Prepare Flagship Program report
24. Prepare Science Strategic Plan

Corporate Overview

25. Prepare Business Development Plan
26. Prepare Commercialisation Plan
27. Prepare "CSIRO Benchmarked" Report
28. Develop and implement Consultation Process for Triennial Funding Agreement
29. Ensure Divisional Strategic Plans align with CSIRO's Strategic Intent
30. Update CSIRO Operational Plan

Business Development

CSIRO must increase its contribution to making Australia both a stronger global competitor in the 21st Century and a better place to live. To do this and to position itself strategically in the new global research context, the Organisation plans to grow its business by moving into new areas of research and new markets, and to provide its staff, many of whom are tired of working in a shrinking organisation, with a healthy and vibrant work environment.

The EMC decided in May 2001, under its 'Go for Growth' key message, to set a target to grow CSIRO's business by 50% to \$1.3b over the five years to 2005/6. This is a challenging objective considering CSIRO's growth history. Furthermore, looking at current Divisional projections suggests there will be a gap between our target and our present growth trajectory. A more impact-oriented approach to Business Development and Commercialisation (BD&C) is needed to bridge that gap.

Key Objectives

Increasing our impact on, and relevance to the nation demands that we pursue a growth strategy, which, in turn, will involve transformational change. In the immediate future within the Business Development arena, the objectives of this transformational change are to:

- Apply a One CSIRO approach to improving BD&C skills and processes across the organization, especially at the project level
- Recruit internally and externally to raise BD&C capabilities and service orientation
- Achieve 10x10 strategic alliance goals and focus on state and international targets
- Enhance corporate strategic planning processes by injecting external perspectives
- Focus each key leader in CSIRO on a single priority for growth and value creation.

Key Actions 2002-03 (Coordinating Responsibility: Mehrdad Baghai)

31. Pursue the 10x10 strategy for major strategic alliances
32. Focus marketing activities of state relationship Managers on the 10x10 strategy
33. Complete arrangements for Sector Advisory Councils (SACs)
34. Implement New Key Account Management arrangements
35. Manage CSIRO entry into and participation in CRC Round 8
36. Manage the specification of Customer Relationship Management (CRM) systems
37. A new approach to one-CSIRO Market and Business Intelligence
38. Develop country- and region-specific business development strategies
39. Enhance BD&C skills across CSIRO
40. Commence development of standard form agreements
41. Strengthen relationships with international research institutions

Commercialisation

CSIRO exists to deliver science and innovation of relevance and impact to the nation. Achieving this depends, in part, on the effective transfer of the Organisation's science, technology and know-how. This, in turn, requires CSIRO to enhance its commercialisation of research, in particular for CSIRO to increase the level of engagement with its stakeholders. New enterprise creation and Intellectual

Property (IP) licensing (often in partnership) are two fundamental instruments to effect this engagement in the commercial domain.

Key Objectives

Increasing our impact on, and relevance to the nation demands that we pursue a growth strategy, which, in turn, will involve transformational change. In the immediate future within the Commercialisation arena, the objectives of this transformational change are to:

- Significantly contribute to wealth creation in Australia by enhancing the relevance and impact of CSIRO through timely delivery of the maximum number of high-quality new enterprises
- Maximize returns on CSIRO's knowledge creation through the commercial exploitation of CSIRO's IP portfolio
- Refine and articulate CSIRO's value proposition
- Position CSIRO in the National Innovation System
- Streamline existing ComEx operations by integrating business development, commercial and legal processes
- Apply a One CSIRO approach to improving BD&C skills and processes across the organization, especially at the project level
- Recruit internally and externally to raise BD&C capabilities and service orientation

Key Actions 2002-03 (Coordinating Responsibility: Mehrdad Baghai)

42. Develop Growth Strategy
43. Streamline ComEx processes
44. Form BD&C Action Team
45. Spin-off identification, development and approval processes
46. Improve support for spin-offs and licensees
47. Finalise Uniseed Alliance
48. Further develop interactions with Pre-Seed Funds (PSFs)
49. Initiate review of CSIRO's IP strategy
50. Initiate detailed review of Divisional projects
51. Improve Commercial Information System (CIS)
52. Support Commercial Executive Committee (ComEx) and the Board Commercial Committee (BCC)

e-CSIRO

CSIRO has much to gain by taking a leadership role in the application of IT in carrying out its mission as a world-class scientific research organisation. We need to enhance the quality of key enterprise processes supporting our ability to achieve our goals and build and offer new services. While there are many areas in which our use of IT compares favourably with our competitors and collaborators, there is a large gap between where we are now and where we need to be to effectively address our six key messages.

Commitment to the "One CSIRO" philosophy means we are now well placed to establish an environment in which we can share our knowledge across organisational boundaries. This will support our being able to achieve the unique benefits of being one of the world's most comprehensive research organisations.

Many of the issues we will need to address are cultural; if we are to realise our One-CSIRO philosophy we must reflect this in a One-CSIRO IT environment both internally and externally. Additionally we must foster an investment approach to IT expenditure.

Corporate Overview

Key Objectives

To accelerate the transition to e-CSIRO so that the innovative use of Information and Communication Technology will give us a competitive advantage in everything we do and a peerless ability to do business in new and unpredictable ways.

Key actions 2002-03 (Coordinating Responsibility: Ron Sandland)

53. Review new management arrangements within ITS
54. Implement business innovation/e-CSIRO governance model
55. Prepare formal e-CSIRO Strategic Plan
56. Develop and implement e-CSIRO communication plan
57. Benchmark e-CSIRO against best international practice
58. Develop an e-Science focus for e-CSIRO
59. Continue development of CSIRO's Unified Web Presence
60. Enhance IT support for key enterprise processes
61. Review of CSIRO's Major System Requirements
62. Execute CSIRO infrastructure projects on a 90-day cycle.

Communications

CSIRO's current approach to communication and relationship building with its stakeholders (e.g., Government - Federal, state and local; business; academia; community; and CSIRO staff) has been fragmented and reactive. We need to:

- ensure positive understanding and ongoing dialogue between CSIRO and government around our role, contribution and value – in particular to develop a constructive relationship with the Federal Cabinet, their advisers and the bureaucracy
- develop a wider understanding in the business community (both large and small companies) of the opportunities to be gained through engagement with CSIRO
- enhance the public's understanding of the role of science and technology
- improve the effectiveness of our relationships with the Academies, CRCs, academics and other research providers (locally and internationally)
- improve internal communication to strengthen organisational cohesion and individual understanding/appreciation of organisational strategy and objectives, challenges, opportunities and successes.

Key Objectives

To strengthen CSIRO's positive influence and contribution to Australia's science and technology/innovation system, by constructively engaging with government, business, academia, CSIRO staff, and the public at large.

Key Actions 2002-03 (Coordinating Responsibility: Di Jay)

63. Further build Government relationships
64. Further develop Internal & Change Communications
65. Strengthen Communication effectiveness
66. Run a "One CSIRO" communicators network workshop
67. Develop a "One CSIRO" Marketing & Promotion Plan
68. Develop a "One CSIRO" Web Presence
69. Evaluate stakeholder & issues management
70. Implement strategy for Universities/CRCs/Academia

Operating Excellence

CSIRO must introduce and/or develop the very best operating and management systems to ensure the Organisation operates with maximum efficiency and effectiveness. Such systems are a critical part of doing business and delivering science-based services.

Key Objectives

- To deliver excellent service to our customers, both internal and external;
- To relentlessly pursue operating efficiencies and effectiveness.

Key Actions 2002-03 (Coordinating Responsibility: Mike Whelan)

71. Strengthen CSIRO's project management practices
72. Introduce web-based CSIRO policies framework
73. Implement effective change management processes

FINANCIAL RESOURCES AND STAFF NUMBERS

Table 1 provides an overview of CSIRO's financial and staff resources for 2002-03. **Table 1 should be read in conjunction with the following notes, which also apply to the resources summary at the end of each Divisional entry.**

Financial details are budget estimates for 2002-03 as at 11 September 2002.

- *Research and Services Revenue* is as defined for CSIRO's external earnings performance indicator (PI). After adjusting for the Capital Use Charge (see note following), CSIRO's estimated external earnings PI ratio for 2002-03 is 35.7 % (adjusted for work-in-progress and deferred revenue). The PI definition excludes 'other external revenue' from both numerator and denominator.
- *Cash Balance* is the estimated cash balance as at 30 June 2003.
- *Strategic Action Plan Initiatives (line items)*. Appropriation funds allocated for these initiatives will be distributed to participating Divisions as detailed planning progresses.
- *CUC Revenue (line item)*. A Capital Use Charge (CUC) is part of the Governments accrual budgeting framework. It is funded by increasing the Organisation's appropriation by 11% of the opening net asset position. This is received as part of the Organisation's appropriation during the year, and paid to the Commonwealth as a dividend in June.

Staff numbers are full time equivalents including indefinite and term CSIRO Officers only as at 30 June 2002.

- *Research Staff* is defined to include the Research Scientist/Engineer, Research Projects and Research Management functional classifications.
- *Total Staff* includes Research Staff plus the remaining functional classifications (Technical Services, Communications and Information, Administrative Services, General Services, Corporate Management and Senior Specialist).

National Facilities: The Australia Telescope, Oceanographic Research Vessel, Australian Animal Health Laboratory (AAHL), and National Measurement Laboratory (NML) are National Facilities managed by CSIRO on behalf of the government. In Table 1, resources for AAHL are included in Livestock Industries and resources for NML are included in Telecommunications and Industrial Physics.

CSIRO Publishing operates as a self-contained business unit publishing products and providing services for Australian and overseas markets in four main product streams: primary research journals; academic books and CDs; education and general reference books, magazines and CDs; and multimedia products and services.

Discovery Centre. Located in Canberra, Discovery is dedicated to Australian research and innovation. It houses an interactive exhibition of leading edge CSIRO research, plus a Science Education Centre, lecture theatre, café and glass-walled laboratories through which visitors can watch scientists at work.

Corporate Overview

Food Science Australia is a joint venture between CSIRO (through the Division of Food Science and Technology) and the Australian Food Industry Science Centre (Afisc). CSIRO's direct contribution to the joint venture is \$16.7m for 2002-03. Figures in Table 1 represent an estimate of CSIRO's operational activities in the joint venture which differ from the legal interest.

Table 1: CSIRO Financial Resources and Staff Numbers *

	Revenue					Operating Result	Cash Balance	Capital Expenditure	Research Staff	Total Staff
	Total	Research & Services	Other External	Direct Appropriation	CSIRO-wide services					
Divisions:										
Atmospheric Research	\$19.651	\$6.146		\$12.445	\$1.060	\$-0.132	\$-0.317	\$0.600	96	127
Australia Telescope National Facility	26.114	6.340	0.300	18.066	1.408	1.023	3.956	4.842	61	125
Energy Technology	22.527	6.180	1.150	13.982	1.215	0.278	0.512	1.250	111	148
Entomology	35.893	17.563	0.357	16.038	1.935	0.077	0.735	1.220	192	254
Exploration & Mining	38.162	17.552	0.096	18.456	2.058		0.229	1.600	160	232
Food Science	16.667			15.768	0.899		3.626		124	184
Forestry & Forest Products	30.309	11.500	0.150	17.025	1.634	0.005	4.854	1.000	158	219
Health Sciences & Nutrition	22.606	6.685	0.025	14.677	1.219	1.868	2.121	2.200	120	164
Land & Water	53.845	19.380	0.291	31.271	2.903	-0.648	7.274	2.600	310	452
Livestock Industries	76.599	23.431	0.562	48.475	4.131	-2.583	8.691	4.597	278	479
Manufacturing & Infrastructure Technology	77.295	24.842	0.337	47.948	4.168	0.347	5.988	4.800	362	482
Marine Research	38.784	12.464	0.239	23.990	2.091	-0.797	13.819	1.718	197	289
Oceanographic Research Vessel	6.830	0.150	0.030	6.282	0.368	0.750	-6.238	1.610	1	8
Mathematical & Information Sciences	34.852	11.992	0.300	20.681	1.879	-1.942	3.674	0.770	189	267
Minerals	39.175	15.890	0.095	21.078	2.112	0.460	2.307	4.500	177	262
Molecular Science	39.798	17.796	-0.027	19.883	2.146	1.701	1.310	1.000	168	215
Petroleum Resources	19.522	8.108		10.361	1.053	0.249	0.043	0.600	72	106
Plant Industry	81.054	37.500	0.870	38.313	4.371	-0.511	10.395	2.607	520	652
Sustainable Ecosystems	39.745	12.473	0.458	24.671	2.143	-0.950	8.148	1.785	197	281
Telecommunications & Industrial Physics	64.283	21.800		39.017	3.466	-0.852	7.265	2.900	281	394
Textile & Fibre Technology	24.006	9.960	0.511	12.241	1.294	0.231	9.058	2.100	105	189
Divisional Total	807.717	287.752	5.744	470.668	43.553	-1.426	87.450	44.299	3,878	5,529
Other:										
Outreach Programs:										
<i>CSIRO Publishing</i>	9.845	7.958	0.637	0.718	0.532	0.749	3.476	0.050		
<i>Discovery Centre</i>	0.743		0.103	0.600	0.040	-0.286	0.187			
<i>Education</i>	3.325		2.342	0.983						
Strategic Action Plan Initiatives:										
<i>Flagship Programs</i> ®	13.350			13.350						
<i>New Science Initiatives</i> ®	14.000			14.000						
<i>Post Doctoral Fellowship Program</i> ®	0.480			0.480						
<i>Commercialisation Initiatives</i>	14.300			14.300						
<i>e-CSIRO/ Infrastructure</i>	14.067			14.067			-4.267	4.360		
<i>Other initiatives</i>	3.492			3.492						
Science Coordination & Management	5.666			5.666						
Non-discretionary obligations	3.200			3.200						
CSIRO-wide services	2.008		2.008	44.125	-44.125		2.301	0.050		
Capital Program +	18.422		3.430	14.992		2.577	28.724	42.687		
Corporate Funds	-65.748		2.472	-68.220		-58.139	3.233			
Other Total	37.150	7.958	10.992	61.753	-43.553	-55.099	33.654	47.147	17	321
Organisation Total excluding CUC	844.867	295.710	16.736	532.421	0.000	-56.525	121.104	91.446	3,895	5,849
CUC Revenue	107.208			107.208						
Organisational Total	952.075	295.710	16.736	639.629	0.000	-56.525	121.104	91.446	3,895	5,849

* Staff numbers as at 30/06/02 and budget estimates for 2002-03 as at 11/09/02. See further explanatory notes in the corresponding section of the text.

@ Amounts remaining to be allocated to Divisions.

+ Includes appropriation funding for sale and lease back of CSIRO property.

ORGANISATIONAL PROFILES: BUSINESS DOMAIN, CUSTOMERS AND SECTORS**Research and Services Revenue by Business Domain**

Coinvestment (Strategic R&D)	\$m	193.614
Research Services, Consulting and Testing	\$m	82.272
Intellectual Property*	\$m	16.369
Sub-Total (Invoiced Revenue)	\$m	292.255
Work-in-progress / Deferred Revenue	\$m	3.455
Total	\$m	295.710

* Revenue from royalties and licence fees

Customer Profile *

Australian Private Sector	\$m	99.040
Research and Development Corporations	\$m	38.179
Australian Governments	\$m	67.320
Cooperative Research Centres	\$m	29.141
Overseas	\$m	42.206
Total	\$m	275.886

* Applies to invoiced revenue in the Coinvestment and Research Services, Consulting and Testing Domains only.

Planned Investment Profile by Sector*

Agribusiness	%	27.3
Natural Resources Management & Environment	%	20.4
Manufacturing	%	17.5
Mineral Resources	%	11.6
Information, Communication & Services	%	6.8
Energy & Transport	%	5.8
Health	%	5.4
Radio Astronomy (ATNF)	%	3.4
Measurement Standards (NML)	%	1.8
Total	%	100

* This profile shows the anticipated distribution of total expenditure from all fund sources and reflects CSIRO's new Sector advisory arrangements. From 1 July 2002, seven new Sector Advisory Councils, the ATNF Board and the Measurement Standards Advisory Group replace the former 22 Sector Advisory Committees.

CSIRO's PARTICIPATION IN COOPERATIVE RESEARCH CENTRES

Cooperative Research Centres (CRCs) bring together researchers and research groups from universities, state government agencies, business enterprises and commonwealth research organisations such as CSIRO.

CRCs undertake collaborative research and education programs in the fields of natural sciences and engineering, with a strong focus on commercial and other applications. The Commonwealth Government provides up to fifty per cent of the cost of establishing and operating a centre. The participating organisations contribute the balance of required resources in cash or kind. CSIRO accounts for approximately 17.6 per cent of resources committed to centres by participating organisations over the contract period.

The CRC Program was launched in May 1990. CSIRO is a participant in 13 of the 19 new centres announced in January 2001 under the seventh round of funding. The eighth round of applications is currently under consideration by the CRC Committee and the announcement of successful proposals is

Corporate Overview

due in December 2002. As at 30 June 2002 CSIRO was a participant in the 46 centres listed below (out of 64 current CRCs).

Further information on the CRC Program and individual Centres can be found at the following internet address: www.crc.gov.au/.

Manufacturing Technology

- CRC for International Food Manufacture & Packaging
- CRC for Intelligent Manufacturing Systems & Technologies
- CRC for Bioproducts
- CRC for Cast Metals Manufacturing
- CRC for Welded Structures
- CRC for Functional Communication Surfaces
- CRC for Construction Innovation
- CRC for Polymers
- CRC for Innovative Wood Manufacturing
- CRC for Micro Technology

Mining and Energy

- Australian Petroleum CRC
- CRC for Landscape Environments & Mineral Exploration
- CRC for Coal in Sustainable Development
- AJ Parker CRC for Hydrometallurgy
- CRC for Clean power from Lignite
- CRC for Predictive Mineral Discovery

Medical Science and Technology

- CRC for Vaccine Technology
- CRC for Diagnostics
- CRC for Tissue Growth and Repair
- CRC for Eye Research and Technology
- CRC for Cellular Growth Factors

Information and Communication Technology

- CRC for Enterprise Distributed Systems Technology
- CRC for Satellite Systems
- Australian Telecommunications CRC

Agriculture and Rural Based Manufacturing

- CRC for Innovative Dairy Products
- CRC for Viticulture
- Australian Sheep Industry CRC
- CRC for Tropical Plant Protection
- CRC for Cattle and Beef Quality
- Australian Cotton CRC
- CRC for Sustainable Rice Production
- CRC for Sustainable Production Forestry
- CRC for Sustainable Aquaculture of Finfish
- CRC for Sustainable Sugar Production

Environment

- CRC for Catchment Hydrology
- CRC for Greenhouse Accounting
- CRC for Waste Management & Pollution Control
- CRC for Freshwater Ecology
- CRC for Antarctica and the Southern Ocean
- CRC for Australian Weed Management
- CRC for the Biological Control of Pest Animals
- CRC for Coastal Zone, Estuary and Waterway Management
- CRC for Water Quality and Treatment
- CRC for Tropical Savannas Management
- CRC for Plant-based Management of Dryland Salinity
- CRC for Tropical Rainforest Ecology and Management

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Focus

CSIRO Atmospheric Research conducts world-class research into the atmospheric environment and provides advice and applications for the benefit of Australia. The Division serves Australia through outcomes that benefit industry, the economy and the environment, provide social benefit and support national and international objectives. The Division addresses issues such as urban and regional air pollution, the enhanced greenhouse effect (global warming), ozone depletion, climatic variability and severe weather. Research tools include computer-based climate and atmosphere models, remote sensing and a range of high precision atmospheric monitoring instruments. Key stakeholders include Commonwealth and State Environment Departments, the community and educational institutions, business, energy and mineral resource companies.

Context

With increasing 'globalisation', there is a growing potential for international research and development providers to compete for business in Australia and the Australasian region. In response we will have to be more professional in engaging potential clients and stakeholders, building stronger and lasting relationships. The global trend towards smaller government, privatisation of government instrumentalities and decentralisation is likely to make the engagement of stakeholders in some industries (eg water resources, power generation and environmental protection) more difficult and complex.

Society is increasingly demanding sustainable solutions for environmental problems that take account of economic and social imperatives. This requires us to engage in broad research partnerships to provide more comprehensive scientific assessments that go beyond the core competencies of CSIRO Atmospheric Research. Natural resource management will be a major focus of sustainability research in Australia. Our contributions on climate change and climate variability will be extremely valuable, provided they are integrated with the wide range of disciplines that deal with this national priority issue.

The CSIRO Strategic Action Plan provides a template for our approach over 2002-03 to our people, our business and our stakeholders. Staff development, and our response to issues of concern identified in the staff poll ('high workload'; 'working relationships') are a high priority, as are the building of strong internal and external research alliances (one-CSIRO, partnerships).

Strategies

There is great national and international demand for data, information and advice about changes to the atmospheric environment and for solutions to major environmental issues and problems, such as climate change and ozone depletion. Air pollution and climate variability continue to affect our prosperity and welfare. We will make significant contributions to the **Healthy Country** and the **Preventative Health** flagship programs, and to the **Energy Transformed** and **Light Metals** programs. Our research and development in climate and earth systems modelling is also well-placed to make significant contributions to the **Complex Systems Science** and **Social and Economic Integration** strategic science initiatives.

Research advances, underpinned by sophisticated computing and information technology, are allowing development and application of climatic and air quality models of increasing realism, allowing for better accuracy and greater detail of predictions. A major focus in 2002-03 will be the building of partnerships with University researchers and other research providers to enhance the applications and utility of our climate and pollution models.

The Division is a major user of the joint supercomputing facility, shared by CSIRO and the Bureau of Meteorology. The facility supports the Division's climatic and air quality modelling. We will support the CSIRO review of supercomputing to ensure such essential underpinning research technology remains at the cutting edge and part of CSIRO's infrastructure.

In 2002-03 we will work closely with the Australian Greenhouse Office to assess the effectiveness of the external support from the Australian Greenhouse Science Program, and to develop new workprograms as a basis for ongoing support.

Our scientific contributions to development of government policy through briefings, submissions and environmental reports are expected to remain significant and to continue. As we contribute about half of CSIRO's total effort in climate and atmosphere research and development, we plan to continue our role in the coordination of the research effort across some 10 Divisions of the Organisation.

In 2002-03 the term of our current Chief of Division is due to conclude, and the Division is spending a significant amount of effort on assessing its operations and future directions. Our current process of engaging Program and Team Leaders as part of this strategic assessment and succession planning effort is due to continue.

Finally (with the rest of CSIRO) we are in the process of reviewing and revising our business development plan, and are expecting this effort to remain a major focus throughout 2002-03. In particular, engagement of current and new stakeholders, assessment of our delivery on time and on specifications to clients, and appropriate definition and pricing of our research contracts will remain a high priority.

Planned Achievements (by Sector)

Natural Resources Management and Environment

- Delivery on a contract for Commonwealth and State environment agencies on air toxics.
- Implement an Air Quality Forecasting System for Tasmania and (likely) the Beijing Meteorological Bureau.
- Further market penetration of our air quality model (TAPM, version 2.0 released in early 2002).
- Further work in aerosol monitoring and in particular work on aerosol exposure and health risks.
- Delivery against our major contract on climate change research for the Australian Greenhouse Office.
- Assessment of likely regional impacts of climate change for a number of State Governments.
- Studies of rainfall fluctuations in the south-west of Western Australia.
- Ongoing observations and research on the changing composition of the atmosphere using the Cape Grim Baseline Air Pollution Station, in Tasmania. The Bureau of Meteorology and CSIRO jointly manage the Station.
- Further developments in greenhouse gas monitoring technology (the LoFlo CO₂ instrument), involving potential international partnerships and commercialisation.
- Continued investigations of the viability of satellite-based measurements of greenhouse gas concentrations in partnership with US agencies.
- Applications of three-dimensional carbon transport modelling of the atmosphere and oceans, global and regional inverse modelling and multi-decadal modelling, leading to policy advice on issues relating to changing global greenhouse gas concentrations (relevant to the Government response in post-Kyoto international negotiations).
- Further field experiments to provide Australia-wide validation of satellite-based measurements of atmospheric radiation and aerosol.
- Ongoing collaboration with Australian industry, to develop and commercialise airborne hazard detection technologies.
- Continued development and use of sophisticated climate models to assess likely future regional changes to climate, and testing of model-based multi-seasonal predictions. Outputs will be supplied to agencies such as the Bureau of Meteorology and the Queensland Department of Natural Resources, as well as international institutions and collaborators.
- Development of weather products for specific commercial markets, and exploration of application of these products with commercial partners.

- Further development for commercial application of the canopy lidar, with support from the Forest and Wood Products Research and Development Corporation to validate the lidar techniques.

Energy and Transport

- Atmospheric modelling in support of site assessments for wind farms.

Resources, Revenue and Expenditure Profiles

Resources Summary 2002-03

Total Revenue	\$m	19.651
- Research & Services (R&S)	\$m	6.146
- Other External	\$m	0
- Direct Appropriation	\$m	12.445
- CSIRO-wide Services	\$m	1.368
R&S Earnings Ratio (R&S/Total Revenue)	%	31.3
Operating Result	\$m	(0.132)
End of Year Cash Balance	\$m	(0.317)
Research Staff (full time equivalent)	no.	96
Total Staff (full time equivalent)	no.	127

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	3.548
Research Services, Consulting and Testing	\$m	2.295
Intellectual Property	\$m	0.196
Sub-Total (Invoiced Revenue)	\$m	6.039
Work-in-progress / Deferred Revenue	\$m	0.107
Total	\$m	6.146

Customer Profile *

Australian Private Sector	\$m	0.800
Research and Development Corporations	\$m	0
Australian Governments	\$m	3.893
Cooperative Research Centres	\$m	0.200
Overseas	\$m	0.950
Total	\$m	5.843

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Natural Resources Management & Environment	%	98.6
Energy & Transport	%	1.4
Total	%	100

Focus

CSIRO's Australia Telescope National Facility (ATNF) is one of the world's leading radio-astronomy facilities, and the largest astronomical institution in Australia. As a National Facility, it provides radioastronomy services to astronomers in Australia and internationally, and also takes a position of leadership in several international activities, including the development of the next-generation billion-dollar radio telescope, the Square Kilometre Array (SKA).

By providing telescope facilities to its customers, it advances fundamental knowledge about the Universe whilst striving to maximize the technological, educational, and national benefits that flow to Australia by hosting one of the world's leading observatories, including the development of international linkages. The current foci of the ATNF are to upgrade its observing facilities to maintain its operation as a prestigious world-class national research facility, and to develop the technology for the SKA.

Context

Globally, astronomy is flourishing, with a number of major international projects underway, several of which involve the ATNF. Scientifically, our understanding of the Universe has never advanced at a more rapid rate, with several recent major discoveries that have pushed forward our understanding of the nature and structure of the Universe. This growth in new knowledge, with attendant outreach and educational opportunities, has fuelled a corresponding international growth in funding for new astronomical facilities, which has resulted in new instrumentation contracts for the ATNF.

In 2001 the ATNF led a successful bid for funding under the Government's Major National Research Facilities (MNRF) program, resulting in a \$23.5m grant, part of which will be used to develop technology for the SKA, at the same time upgrading our existing instruments and increasing Australian access to international facilities. The ATNF is also responding to changes in its environment at all levels (CSIRO, Australia, and internationally) by maintaining a high level of connectivity with other institutions whilst maintaining a strong focus on its core business.

Strategies

As a National Research Facility, the ATNF primarily measures its success in terms of the advances in knowledge made by our customers (we currently rank second in the world amongst radio observatories when measured by publications or citations). Other critical objectives are the development of new instrumentation and techniques, new technology and its transfer to industry, and outreach and educational activities.

To maintain operations of the National Facility at a world-class level, the ATNF continually develops and extends the performance of its telescopes. A major upgrade of ATNF observing facilities is approaching completion, which will provide Australia with one of the world's leading millimetre-wave observatories for a window of about 8-10 years.

The ATNF's new flagship development project is the Square Kilometre Array, which is partly funded by MNRF funding. Strong participation in the project will increase the likelihood of Australia hosting the instrument, and ensure that the ATNF will be a key participant in the SKA construction. The ATNF is leading an Australian consortium to start developing the technology for the SKA, and is also working to identify and safeguard potential SKA sites in Australia.

To build up critical mass, expertise, and robustness in the engineering groups, the ATNF will generate revenue and skills by building astronomical instrumentation for other institutions. However, to maintain focus, the ATNF will not actively participate in revenue-generating activities that do not also have a clear benefit either to science or to strategic goals. In 2002-03 ATNF will augment its project management practices by adopting appropriate features from CSIRO's PMI project, and will increase its business development and co-investment activities.

The ATNF astrophysics group exists to maximize the scientific effectiveness of the observatory, by steering the design and commissioning of new technology, by helping users to use the instrumentation most effectively, and by conducting innovative astrophysics projects. The astrophysics group plans to grow the

Australia Telescope National Facility

number of postdocs, and PhD students. It will also work more closely with University partners to explore other funding sources for instrument upgrades.

The ATNF plans to increase its outreach program, and will appoint an education officer to target young people, using astronomy to attract them to science. It will achieve better coordination between our visitors' centres (currently attracting 150,000 people per year) and other outreach activities.

Planned Achievements (by Sector)

Radio Astronomy

- Operate the Parkes, Narrabri and Mopra Observatories, the Long Baseline Array network, and the Marsfield facilities, as National Research Facilities. Provide access to these facilities for both Australian and overseas users on the basis of scientific merit of their proposals.
- Complete the mm upgrade of the Narrabri Compact Array, with five antennas fitted with new 12/3 mm receivers, local oscillators, and antenna control computers.
- Continue to develop new instrumentation to upgrade the existing ATNF facilities.
- Continue to develop new instrumentation under contract to other international observatories.
- Contribute effectively to the international development of technologies for the Square Kilometre Array and to strategic planning at national and international levels. Contribute significantly to SKA technology development, including Luneberg lens development, site surveys, RFI mitigation studies. Conclude all the MNRF agreements, and manage the first year of the MNRF activities through to a successful outcome as measured by milestones.
- Provide an effective public outreach program, measurable in terms of media appearances, talks to schools and community groups, Visitors Centres numbers, and web hits.
- Continue the involvement in national and international activities related to radio-spectrum management, and participate in establishment of Australian radio-quiet reserves. Continue to make key contributions to international scientific and regulatory organisations such as IAU, URSI, CODATA, OECD, and ITU.
- Make new discoveries to advance our understanding of the Universe, including publishing at least 70 scientific papers p.a. in international refereed journals.

Resources, Revenue and Expenditure Profiles

Resources Summary 2002-03

Total Revenue	\$m	26.114
- Research & Services (R&S)	\$m	6.340
- Other External	\$m	0.300
- Direct Appropriation	\$m	18.066
- CSIRO-wide Services	\$m	1.408
R&S Earnings Ratio (R&S/Total Revenue)	%	24.3
Operating Result	\$m	1.023
End of Year Cash Balance	\$m	3.956
Research Staff (full time equivalent)	no.	61
Total Staff (full time equivalent)	no.	125

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	3.590
Research Services, Consulting and Testing	\$m	2.750
Intellectual Property	\$m	0
Sub-Total (Invoiced Revenue)	\$m	6.340
Work-in-progress / Deferred Revenue	\$m	0
Total	\$m	6.340

Customer Profile *

Australian Private Sector	\$m	0.621
Research and Development Corporations	\$m	0
Australian Governments	\$m	2.982
Cooperative Research Centres	\$m	0
Overseas	\$m	2.737
Total	\$m	6.340

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Australia Telescope National Facility	%	100
Total	%	100

Focus

Energy Technology's research contributes to the sustainability of Australia's energy industries and its energy exports. The main activities are coal preparation, clean coal power, distributed energy including using advanced gas technologies, renewable energy, energy storage and efficient end use of energy. The Division contributes to CSIRO's environmental goals through its expertise in air and water quality, solid residues and sludge treatment as well overall commitment to reduced greenhouse gas emissions from energy production and use, including transport.

Context

The Division's relocation of its headquarters to Newcastle scheduled for mid-2003 will be the major factor impacting on the Division's operations in 2002/03. This move will affect some 100 staff and involve the closure of the Division's laboratories at North Ryde in Sydney. The Division will also have to address the outcomes of the current (May 2002) review of CSIRO's energy activities. Some of the outcomes will impact on Energy Technology alone, while others will need a coordinated response from Divisions contributing to the energy portfolio. Included in this is the development of the Energy Transformed Flagship Project.

Externally, the ongoing changes to the energy industry – re-positioning of energy suppliers, distributors and retailers - remain a challenge, as does the changing government response to Kyoto. The federal government (through COAG), will produce a draft energy policy in early 2003 which, when completed and implemented, will lead to further changes to the market and will impact on the sectors investment in R&D and take-up of new technologies.

Strategies

The move to Newcastle will cause some loss of business in the areas affected but continued business development in the water quality, coal preparation and energy storage areas should cushion the effect. The relocation plus the commencement of the Energy Transformed Flagship and the Division's contributions to the Light Metals, Healthy Country and Preventative Health Flagships offer major opportunities to re-skill and re-structure to meet the 50% growth target in the longer-term.

New business managers recently appointed to lead efforts in Gas Utilisation, Energy Efficiency and Energy Modelling, will begin to deliver substantial business in these areas as well as identify areas for strategic investment and new science. This will be aided by expansion of CenDEP (Centre for Distributed Energy and Power) - a joint industry and CSIRO venture established in early 2002 – and by major initiatives within the Energy Transformed Flagship project in the areas of distributed energy, energy efficiency and next-generation transportation.

The Division will continue its long-established links with the coal and power industry through participation in the industry's research arm, ACARP, and the CRC for Coal in Sustainable Development (CCSD). Major projects will be sought in coal gasification and in production and use of methane from coal.

Divisional responses to the CSIRO Strategic Action Plan in terms of operational and commercial changes to achieve business growth, as outlined in the Strategic Business Plan (March 2002), will be implemented. In addition strategies to improve internal communication will be put in place.

Planned Achievements (by Sector)***Energy and Transport******Energy Modelling***

- Identify and compare alternative technological pathways for large-scale power generation taking into account expected future constraints and opportunities.
- Examine issues of technology uptake and market dynamics in relation to distributed energy, efficient energy use and transport.

Distributed Energy (Gas Utilisation)

- Design and construct a microturbine based DE package providing electricity, heating and cooling for commercial buildings.
- Scope and initiate projects on thermo-photovoltaic appliances and gas odorants.
- Expand industry participation in CenDEP (Centre for Distributed Energy and Power) to include 12 Sustaining Members and meet Centre's agreed milestones for 2002/03.

Energy Storage

- Specify, design and install a 1 MWh battery energy storage system for the Newcastle Energy Centre.
- Contribute to the development of 36 V lead acid batteries for 42 V powernets to be used in next generation transport. Build a fully functional 36 V lead acid battery prototype and evaluate it against industry-approved test procedures.
- Devise novel operational strategies for PEM (polymer electrolyte membrane) fuel cells in hybridisation with batteries for transport applications.
- Develop new specifications for raw materials used in the manufacture of valve-regulated lead-acid batteries to enhance their performance.
- Complete the development of specific operational strategies for the Greengel battery for BP Solar and assist the manufacturing company in its development.

Renewable Energy

- Secure funding to establish a database of biomass fuel characteristics for use in combustion/ co-firing or gasification plants.
- Engage potential partners for waste to energy projects - identified as having the greatest near-term potential for bioenergy.
- Identify cost-effective solar concentrators and optimise reactor and operating conditions of hybrid solar/gas technology. Secure industry/government support for building a demonstration plant.
- With industry and university collaborators, plan multi-tower solar array for integration into Newcastle laboratories.

Direct Mitigation of Greenhouse Gas Emissions

- Evaluate process configurations for mitigating GHG emissions from Australian black coal-fired power plants (with CRC for Coal in Sustainable Development).

Energy End Use Efficiency

- Establish a cogeneration research program and prototype demonstration of the TurboChiller combined heat and power (CHP) cogeneration concept.
- Establish a refrigeration and HVAC (heat, ventilation and air conditioning) research program through demonstrations and the development of energy efficient control products.

Mineral Resources**Coal Preparation**

- Develop and progress the Intelligent Plant project area concept and institute a fundamental research program underpinning the concept.
- Progress the Australian Coal Association (ACARP) supported applied projects and secure funding in 2003 bids.
- With industry partner and Japanese collaborator, define future production of ultraclean coal (UCC) from Cessnock pilot plant.
- Sign heads of agreement with key overseas customers for binderless briquetting. Design plant and integrate with customer facilities ready for commissioning in 2004.

CSIRO Energy Technology

Clean Coal Power (Reporting through CCSD)

- Provide coal selection and performance criteria to assist in the marketing and use of Australian coals in advanced power generation technologies that are expected to be introduced around the world over the next 5-15 years.
- Develop suitable technical understanding of advanced, high efficiency power generation technologies to assist the Australian power industry to assess and minimise the technical risks associated with implementation of advanced power generation technologies.

Minerals

- Complete scoping study of opportunities for filtration R&D in the minerals industry. Undertake validation of existing models against actual performance.

Natural Resource Management and Environment

- Contribute to ecological risk assessment of mining and industrial activities on aquatic systems.
- Develop robust chemical and ecotoxicological methods to underpin new water and sediment quality guidelines.
- Contribute to the management of urban air pollution through research on the formation and impact of hazardous air pollutants and fine particles produced from coal utilisation, motor vehicle emissions, other industrial processes and photochemical smog.
- Quantification of the magnitude of biogenic emissions of reactive organic compounds and their role in the formation of urban smog

Resources, Revenue and Expenditure Profiles

Resources Summary 2002-03

Total Revenue	\$m	22.527
- Research & Services (R&S)	\$m	6.180
- Other External	\$m	1.150
- Direct Appropriation	\$m	13.982
- CSIRO-wide Services	\$m	1.215
R&S Earnings Ratio (R&S/Total Revenue)	%	27.4
Operating Result	\$m	0.278
End of Year Cash Balance	\$m	0.512
Research Staff (full time equivalent)	no.	111
Total Staff (full time equivalent)	no.	148

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	5.014
Research Services, Consulting and Testing	\$m	1.050
Intellectual Property	\$m	0.116
Sub-Total (Invoiced Revenue)	\$m	6.180
Work-in-progress / Deferred Revenue	\$m	0
Total	\$m	6.180

Customer Profile *

Australian Private Sector	\$m	3.664
Research and Development Corporations	\$m	0
Australian Governments	\$m	0.600
Cooperative Research Centres	\$m	1.300
Overseas	\$m	0.500
Total	\$m	6.064

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Energy & Transport	%	71.9
Natural Resources Management & Environment	%	23.7
Mineral Resources	%	4.4
Total	%	100

Focus

Aligned with our growth strategy, we have refocused our science around five major outcome areas:

- Plant protection (broadly, protecting crops from pests, weeds and diseases)
- Product protection (protecting stored products such as grains and timber)
- Biosecurity (managing biological threats before the threat is realised)
- Natural resource management (protecting natural ecosystems), and
- Bio-industries (new molecules and systems for industry).

Context

We believe that the fastest growth will be in product protection and bioindustries, with external sources ready to coinvest in these areas. By contrast, improved biosecurity is a major national need and we will invest our own resources to gain credibility in the area before we can expect major coinvestment. We will need to invest in our containment facilities in Canberra, Perth and Brisbane to underpin our plant protection and biosecurity capacity.

Strategies

We will contribute to the development of two CSIRO Flagship projects:

- Healthy Country (e.g. reduction in pesticide use through Integrated pest management / Integrated weed management (IPM/IWM); bioremediation; rapid assessment of ecosystem health)
- Agrifood Top 5 (e.g. storage regimes to maintain or enhance quality of new crops in storage, reduced pesticide residues in export produce).

We will redirect existing resources and recruit approximately 10 post-doctoral fellows and scientists in the emerging science areas of complex systems science and risk analysis, with additional focussed investments in biotechnology (in particular grain protection genes and bioprocessing). We will build our capacity in chemistry and molecular engineering by strategic alliances with the Australian National University and CSIRO Molecular Science.

Our capital investment program will be directed to building biotechnology capacity eg in robotics and bioinformatics, and maintaining our containment capacity.

We will implement an integrated marketing and communication plan aligned to our overall business development strategy.

External business is projected to grow by 8.5% in 2002/03.

We will contribute to the development of a comprehensive orientation program for new recruits and the implementation of career planning for all staff.

Planned Achievements (by Sector)***Natural Resource Management & Environment***

- Create a Centre for Risk Analysis, partnering with industry, government and universities.
- Release of BioLink version 2.0 software for biodiversity information management.
- Determine genetic diversity and population structure and their implications for effective conservation management of the threatened Bathurst Copper Butterfly.
- Diagnostic protocols for key potential exotic invasives (thrips, potato beetle, nematodes).
- Manual on termite biology and management for the (Australian) consumer and professional pest manager.

Manufacturing

- Commercialisation of enzyme bioremediation technology for organophosphate insecticides.
- COS completion of research to define a label for carbonyl sulfide (COS) as a new fumigant for use on grain in Australia.
- Establishment and financing of a company to perform industrial scale discovery of novel antibiotics from CSIRO's Insect Extract Library.
- Completion of Technology Road Map for Bioprocessing, partnering with CSIRO Molecular Science and external stakeholders.

Agribusiness

- The GRDC-CSIRO Grain Protection Genes Joint Venture fully operational, establishing nine new projects and recruiting six post-doctoral staff.
- A new class of insecticidal proteins patented.
- Commercialisation of the Adaptive Discounting grain aeration control method.
- Moisture isotherms and safe limits for storage of oilseeds and pulses.
- Recommendations for control of psocids, reducing the frequency of re-treatment
- Field evaluations of the pest resistance of selected transgenic (Bt) cotton varieties
- Determine how the diversity and abundance of beneficial invertebrates and Helicoverpa are influenced by field level insect management strategies in cotton
- Launch of TIMERITE package for control of redlegged earth mite in eastern States.
- Completion of a pasture simulation model.
- Scoping study for use of infochemicals to enhance quarantine monitoring and surveillance for exotic pests and in autodissemination of insect and weed pathogens.
- Complete screening of a collection of Australian red cedar (*Toona ciliata*) for resistance to cedar tip moth (*Hypsipyla robusta*).

Resources, Revenue and Expenditure Profiles

Resources Summary 2002-03

Total Revenue	\$m	35.893
- Research & Services (R&S)	\$m	17.563
- Other External	\$m	0.357
- Direct Appropriation	\$m	16.038
- CSIRO-wide Services	\$m	1.935
R&S Earnings Ratio (R&S/Total Revenue)	%	48.9
Operating Result	\$m	0.077
End of Year Cash Balance	\$m	0.735
Research Staff (full time equivalent)	no.	192
Total Staff (full time equivalent)	no.	254

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	15.763
Research Services, Consulting and Testing	\$m	0.900
Intellectual Property	\$m	0.900
Sub-Total (Invoiced Revenue)	\$m	17.563
Work-in-progress / Deferred Revenue	\$m	0
Total	\$m	17.563

Customer Profile *

Australian Private Sector	\$m	3.360
Research and Development Corporations	\$m	6.850
Australian Governments	\$m	2.450
Cooperative Research Centres	\$m	1.263
Overseas	\$m	2.740
Total	\$m	16.663

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Agribusiness	%	48.4
Natural Resources Management & Environment	%	25.8
Manufacturing	%	22.1
Health	%	2.2
Information, Communication & Services	%	1.6
Total	%	100

Focus

CSIRO Exploration and Mining provides R&D for the Australian mining industry in a bid to maintain the industry's position among the lowest cost mineral suppliers, simultaneously combining safe production with high community acceptability. The Division spans the full spectrum of mining activities from primary exploration through to mine safety and site rehabilitation. Core science areas include: earth dynamics; informatics; and mechatronics.

Context

Mineral and energy exports currently constitute 37% of Australia's total exports, including services. In addition, almost \$2 billion a year is earned from the export of high-technology mining products and services.

Although low metal prices have led to a decline in global exploration since the peak in 1997, Australia attracts more mineral exploration investment than any other single country, and is seen as a most attractive location for mineral investment.

The mining industry continues to be a strong user of technology and the decision by some major companies to outsource R&D has provided additional opportunities for CSIRO.

CSIRO Exploration and Mining (EM) is expected to remain a high growth, high external earnings component of CSIRO based on the strong industry outlook in Australia and established linkages both domestically and overseas.

Strategies

The Division is planning for continued growth in 2002/03, with a projected increase in external earnings of 13 per cent. We will build on our already strong relationship with industry through the establishment of Commodity Teams to assist the identification of business opportunities linked to Australia's key mineral exports – coal, aluminium, gold, iron ore, copper, zinc and nickel. In embracing the new commodity approach, EM will be working closely with other CSIRO divisions supporting these industries, notably CSIRO Minerals and CSIRO Energy Technology. Enhancing the business and marketing skills base of the Division will be a major focus of attention as we look to capitalise on strong growth potential through an increased emphasis on IP exploitation.

Glass Earth will continue to be the Division's exploration-based flagship project, with an emphasis in the coming year on terrain based studies aimed at demonstrating the new sensing and informatics capabilities delivered through the initial two years of the Glass Earth program. Importantly, the Division will continue to apply these new capabilities to environmental issues (specifically salinity mapping) through the CRC for Landscape Environments and Mineral Exploration (CRC LEME 2) and the Healthy Country Flagship program.

EM's capabilities in data integration and visualisation, mine productivity and mine safety will be key components of the e-Australia Flagship Program.

The Division will strengthen its science base through 10 strategic postdoctoral appointments including in the Complex Systems and Economic and Social Integration emerging science areas and through the CRC for Predictive Mineral Discovery (pmd*CRC).

Compliance with OH&S policies and procedures and safety performance (in particular field safety) will be a priority over the next 12 months through the appointment of key staff in Perth, Brisbane and Sydney.

Capturing the benefits of co-location with CSIRO Petroleum and Curtin University at the Australian Resources Research Centre (ARRC) is a critical success factor, as is developing a closer relationship with the Victorian Government, through the Division's Melbourne Business Office.

Planned Achievements (by Sector)

Mineral Resources

- Strengthen *Glass Earth* as the long-term collaborative project to provide the capabilities to make the top kilometre of the Australian continent transparent. This will be in collaboration with the pmd*CRC, CRC LEME 2 and other parties. This will involve technological advances of data acquisition, modelling and visualisation of geological, geophysical and geochemical data for selected terrains.
- Develop predictive methods for gold exploration based on integrated studies of the world's major gold provinces.
- Undertake initial planning for the establishment of an international nickel centre at the ARRC, Perth to address R&D at all stages in the nickel value chain.
- In collaboration with the South Australian Museum and the ANU, demonstrate the viability of performing *in situ* measurements on experimental systems within a diamond anvil cell using focussed proton beams from the nuclear microprobe. Combine this experimental work, through collaboration with the University of Melbourne, with advanced thermodynamic datasets to enhance understanding of ore formation processes and improve mineral extraction processing.
- Develop the self-organising map methodology as a tool for the visualisation and interpretation of spatially located exploration data.
- Complete and publish case history volumes on 'Regolith-landform evolution in Australia' and 'Regolith expressions of Australian ore deposits'.
- Develop software to identify the existence, location and parameters of dipping tabular base metal deposits from airborne electromagnetic survey data.
- Apply geophysical exploration technologies in defining appropriate and cost effective management options to address dryland salinity and water quality issues in southern Australia.
- Complete laboratory proof-of-concept and laboratory flight simulation experiments for the Australian Gravity Gradiometer, and to begin fabrication of the flight prototype.
- Pursue the development and commercialisation of operational spectroscopic technologies and applications for the mapping of mine-scale mineralogy.
- Enhance the techniques to analyse the structure of rock masses in open pit mines, and extend these for use in underground mines.
- Conduct proof-of-concept cutting trials in sandstone and granite quarries extending SMART*CUT technology to rock drilling, sawing as well as wear-resistant cladding of high pressure grinding rolls.

Energy and Transport

- Undertake minesite demonstrations of mine methane/waste coal power generation using indirectly fired turbine technology.
- Further develop and commercialise mine engineering tools and technologies for the enhancement of coal and minerals extraction with particular emphasis on longwall mining operations.
- In collaboration with CSIRO Manufacturing & Infrastructure Technology, develop automation and communication systems for existing mine equipment such as underground vehicles, coal shearers and roadway development machines.

Resources, Revenue and Expenditure Profiles

Resources Summary 2002-03

Total Revenue	\$m	38.162
- Research & Services (R&S)	\$m	17.552
- Other External	\$m	0.096
- Direct Appropriation	\$m	18.456
- CSIRO-wide Services	\$m	2.058
R&S Earnings Ratio (R&S/Total Revenue)	%	46.0
Operating Result	\$m	0
End of Year Cash Balance	\$m	0.229
Research Staff (full time equivalent)	no.	160
Total Staff (full time equivalent)	no.	232

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	13.826
Research Services, Consulting and Testing	\$m	0.960
Intellectual Property	\$m	0.049
Sub-Total (Invoiced Revenue)	\$m	14.835
Work-in-progress / Deferred Revenue	\$m	2.717
Total	\$m	17.552

Customer Profile *

Australian Private Sector	\$m	5.343
Research and Development Corporations	\$m	0
Australian Governments	\$m	2.743
Cooperative Research Centres	\$m	3.500
Overseas	\$m	3.200
Total	\$m	14.786

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Mineral Resources	%	67.0
Energy & Transport	%	33.0
Total	%	100

Focus

Food Science Australia (FSA) is an unincorporated joint venture between CSIRO and the Australian Food Industry Science Centre. FSA's multidisciplinary skill base and infrastructure are unique in Australia. It works closely with a wide range of industries, including the dairy, meat, milling, baking, snack and fruit and vegetable processing industries, as well as with service providers to those industries, such as packaging, transport and storage companies. In association with other CSIRO Divisions, FSA offers research and technical services that solve problems for the food industry at every stage of the processed food business system. FSA also contributes to other Sectors, particularly Meat, Dairy and Aquaculture; Chemicals and Plastics; Field Crops; and Horticulture.

Context

Globalisation is the major driver of the food industry, resulting in concentration of effort and resources. Where companies choose to use external research providers in their research and development activities, they will source them on the basis of quality of delivery, irrespective of geographical location.

The Australian government is developing a national food industry strategy to position the country to take advantage of the opportunities offered by globalisation. The government sees CSIRO as a key component of that strategy.

Consumers are increasingly demanding food products that are safe, high quality and competitively priced. They are conscious of the linkages between health, diet and food. Functional foods and ingredients are becoming increasingly valued as an alternative to pharmaceuticals in the delivery of health interventions.

Food Science Australia will take possession of a new laboratory complex at North Ryde. This will provide a facility, which will significantly increase the capacity to carry out world-class research in food.

The proposed Food for Life Centre of Excellence is still under negotiation. Should the parties come to a satisfactory agreement on funding and siting issues, the new physical facility will provide world-class facilities in Queensland specialising in meat research, functional foods and ingredients derived from tropical and subtropical horticulture.

Strategies

- In response to the globalisation of the food industry, develop a focussed portfolio of core science based on nine world class capability platforms: integrated food safety; food component separation; ingredient functionality; fermentations (cheese and plant cell culture); emerging food processing technologies; sensing and unit process automation; active packaging and coatings; maintenance of product quality in distribution systems and market and consumer understanding.
- Use the food industry's commitment to CSIRO as part of the National Food Industry Strategy to secure world class capability in scientific human resources, matched to our world class capability platforms.
- Develop strategic relationships with various State Government agencies, Universities and other government instrumentalities with particular emphasis on joint appointments and secondments to enhance our capability to undertake major research projects of national importance.
- Increase cross divisional interaction to provide through-chain solutions in agribusiness stretching from agricultural production through to consumer products including a major commitment to the CSIRO Flagship Projects, Agrifood Top 5 and Preventative Health.
- Continue to build relationships with State Governments to enhance our R&D infrastructure, particularly in Queensland through the Food for Life Centre of Excellence proposal.
- Develop greater understanding of consumer needs and perceptions through our Business Development and Knowledge Management group activities.
- Increase international business development through partnering with organisations including TNO, Itochu Corporation (Japan) and International Product Safety Consultants (USA).

- HR and Learning and Development Plan being developed.
- Exploration and development of the leadership 'bench'.
- Implement a change management process with respect to financial management that links financial imperatives with the strategic intent of the organisation. This includes value based pricing, optimal financial decision making, project management, cost controls and review of completed projects and capital budgeting.
- Carry out a major review all projects to ensure appropriate portfolio balance and fit with the capability platforms.
- Better exploit the value to the organisation of intellectual property through changes to the structure and staffing of the Food Science Australia Commercial Group.

Planned Achievements (by Sector)

Agribusiness

- Commercialisation of technologies for: pectin production; plant cell culture system for the manufacture of food ingredients; ingredient micro-encapsulation.
- New major collaborative research project with GRDC in food polymer science.
- Improved understanding of the development of flavour precursors in cheddar cheese leading to improved consistency and quality control.
- Innovation in the application of power ultrasonics to enhance reactions in food manufacturing - improved microbiological decontamination & waste management.
- Determination of critical process parameters for ultra high pressure inactivation of forborne viruses.
- Develop a microarray detection system based on virulence determinants in *Salmonella* and *Campylobacter* in support of the poultry industry.
- Assessment of risks associated with *enterococcus* sp as a carrier of antibiotic resistant genes in dairy based products.
- Development of a commercial prototype carcass auto splitter for process mechanisation in abattoirs.
- Development of mathematical models to predict the quality of stone fruit at out-turn in Asian markets.
- New international business opportunities developed through partnering with TNO and Itochu corp. and IPSE.

Manufacturing

- Demonstration of proof of concept in novel tamper evident packaging film for foods.
- Finalise and validate a method for the quantification of di-isopropyl naphthalene, a contaminant arising from inks in recycled paperboard.

Research Support

- Review being undertaken of FSA OHS operations and strategy for implementation and further evaluation.
- Implementation of focus group initiatives arising from 2001 Staff Poll in the areas of career development and leadership development.
- New five year corporate plan incorporating a five year capital plan developed for Food Science Australia.

Resources, Revenue and Expenditure Profiles

These tables reflect the total position of the joint venture between CSIRO and Afisc. CSIRO's direct contribution is \$16.667 million for 2002-03. CSIRO has a 50 per cent interest in the joint venture.

Resources Summary 2002-03

Total Revenue	\$m	38.226
- Research & Services (R&S)	\$m	16.528
- Other External	\$m	1.960
- Victorian Government Contribution	\$m	3.071
- CSIRO Direct Appropriation	\$m	15.768
- CSIRO-wide Services	\$m	0.899
R&S Earnings Ratio (R&S/Total Revenue)	%	43.2
Operating Result	\$m	0.820
End of Year Cash Balance	\$m	0.957
Research Staff (full time equivalent)	no.	185
Total Staff (full time equivalent)	no.	261

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	7.844
Research Services, Consulting and Testing	\$m	8.168
Intellectual Property	\$m	0.300
Sub-Total (Invoiced Revenue)	\$m	16.312
Work-in-progress / Deferred Revenue	\$m	0.216
Total	\$m	16.528

Customer Profile *

Australian Private Sector	\$m	8.878
Research and Development Corporations	\$m	5.800
Australian Governments	\$m	1.854
Cooperative Research Centres	\$m	0.946
Overseas	\$m	0.986
Total	\$m	18.464

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Agribusiness	%	95.5
Manufacturing	%	4.5
Total	%	100

Focus

By igniting the creative spirit of our people we deliver great science and innovative solutions for industry, society and the environment. Our highly skilled people work in teams providing solutions to meet current and longer-term needs of private companies, government departments and agencies, international aid agencies and the community. Our strategic position and our partnerships allow us to meet the needs of an increasingly globalised industry, especially in the areas of sustainability and productivity improvement of planted forests, environmental services from forests, risk management, resource and product quality assessment and improvement, processing efficiency and product performance.

Context

New investment in plantations and wood processing capacity is shifting from the northern hemisphere to the faster growing, lower cost regions of the southern hemisphere. Australia's political and economic stability, close proximity to Asia and highly educated workforce make it attractive for international forest investment, as a number of major forest companies have demonstrated. Private domestic investment in plantation forests has increased over the past decade, stimulated by taxation incentives. The outlook for value added processing and new product development in Australia is promising. Tree-based solutions to the prevention and correction of environmental degradation and pollution are of increasing interest to governments, public agencies and national and international companies. Prospects of markets being established for carbon credits and to a lesser extent for salinity and biodiversity credits are driving new investment and renewed interest in planted forests. Australia's plantation estate has grown by 40% since 1994. With hardwoods comprising most of the plantation growth, the proportion of softwoods has fallen from 85% in 1995 to 67% in 2000. Competition in Australia's small but growing forestry and forest products research market is intensifying, with new entrants and the formation of new partnerships between existing providers.

Strategies

Forestry & Forest Products is renewing itself to meet the challenge of growth in the face of a changing industry and competitive research services market. The renewal program will facilitate transition to new research priorities and a new organisational structure.

People: The health and safety of our people is our first priority. We will invest in people to improve their resourcefulness and capacity to meet new challenges. We will align our science leaders development program with our new directions.

Partnerships: With Plant Industry and Livestock Industries we will form the CSIRO Centre for Quantitative Genetics. We will lead the formation of a one CSIRO alliance with the Australian Greenhouse Office and serve as the entry point to CSIRO for major national and international companies in the forest sector. We will build our scientific capacity and quality through partnerships, including the Healthy Country and Energy Transformed Flagship Projects and in the emerging science areas of Biotechnology, Complex Systems, ICT and Social and Economic Integration. Coinvestment in CRCs is to build partnerships and to position in new market segments and regions in line with longer-term goals.

Products: Market opportunities will be explored for existing IP and options for new products and services will be investigated utilising in-house expertise, CSIRO corporate commercial and legal specialists and external specialists.

Process improvement: We will enhance our knowledge management systems, implement Project Management Improvement, improve project and proposal development, and implement new project-based financial management, reporting and budget allocation procedures

Planned achievements (by Sector)

Agribusiness

- Characterised families of eucalypt beta and alpha tubulin genes, which may play an important role in controlling microfibril angle, a determinant of fibre strength.
- Establishment of *E.occidentalis* as a model species for molecular biology research.

CSIRO Forestry and Forest Products

- Breeding five priority eucalypt species for the southern Australia dry zone.
- Decision support system to increase quality and quantity of wood from intensively managed softwood plantations.
- Guidelines and models for the sustainable management of eucalypt plantations.
- Revised guidelines for effluent irrigated plantations and new models for Victoria.
- Guidelines for re-forestation on farms in saline and drought prone environments.
- Prototype ground-based canopy lidar and evaluation of its use for forest inventory.
- Screening program for susceptibility of eucalypts and other myrtaceae to guava rust and a DNA-based diagnostic probe for detection of this serious exotic pathogen.
- Delivery of SilviScan-3 to Swedish Pulp and Paper Research Institute.
- Commercialisation of integrated wood quality assessment services.
- Profitable provision of world-leading wood fibre evaluation services.

Natural Resource Management and Environment

- Major input to refinement of regional water management policy in South Australia.
- Survival probabilities for bushfire tankers with a spray protection system. [Also Agribusiness]
- New packages for prediction of fire behaviour. [Also Agribusiness]
- Carbon Accounting Toolbox for project-level carbon accounting in forests.

Manufacturing

- Internationally competitive pilot scale medium density fibreboard (mdf) plant fully commissioned.
- Evaluation of the potentials of plantation grown blue gum and dry country grown sugar gum for producing high value solid wood products.
- Prototype wood gasifier integrated with micro turbine for generating electricity.
- Trials of novel paper coating formulations using laboratory paper coating facility.
- Licence technology for a new paper product jointly with CSIRO Manufacturing and Infrastructure Technology.

Resources, Revenue and Expenditure Profiles

Resources Summary 2002-03

Total Revenue	\$m	30.309
- Research & Services (R&S)	\$m	11.500
- Other External	\$m	0.150
- Direct Appropriation	\$m	17.025
- CSIRO-wide Services	\$m	1.634
R&S Earnings Ratio (R&S/Total Revenue)	%	37.9
Operating Result	\$m	0.005
End of Year Cash Balance	\$m	4.854
Research Staff (full time equivalent)	no.	158
Total Staff (full time equivalent)	no.	219

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	8.050
Research Services, Consulting and Testing	\$m	3.400
Intellectual Property	\$m	0.050
Sub-Total (Invoiced Revenue)	\$m	11.500
Work-in-progress / Deferred Revenue	\$m	0
Total	\$m	11.500

Customer Profile *

Australian Private Sector	\$m	1.080
Research and Development Corporations	\$m	1.557
Australian Governments	\$m	5.400
Cooperative Research Centres	\$m	1.614
Overseas	\$m	1.800
Total	\$m	11.450

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Agribusiness	%	55.5
Manufacturing	%	27.9
Natural Resources Management & Environment	%	13.4
Energy & Transport	%	2.1
Information, Communication & Services	%	1.2
Total	%	100

Focus

CSIRO Health Sciences and Nutrition is a centre of excellence for health and nutrition research, serving the Australian community and the food processing, pharmaceutical and biotechnology industry sectors. The Division conducts life sciences research focused on the improvement of human well being and community health through research in the key areas of preventative health, diagnostics and therapeutics. This is achieved through the application of skills in nutrition, physiology, psychology, biochemistry, pharmacology, protein chemistry, molecular and cellular biology, fermentation and structural biology.

Context

Factors internal and external to the Division present exciting opportunities for growth and contribution to the shift to a research enterprise. State and federal government initiatives as diverse as the Australian Synchrotron and Federation Fellowships offer potential benefits. Involvement with the Cooperative Research Centres (CRCs) for Diagnostics and Cellular Growth Factors remain important to the Division's research portfolio, whilst the cessation of the CRC for Tissue Growth and Repair in June 2002 requires careful planning for the return of CSIRO staff. The outcome of the proposal for a NeuroBiotechnology Centre of Excellence will be known early in 2002/03, with implications for Divisional research.

The Division is involved in the Preventative Health and Agrifood Top 5 flagship projects, both commencing in 2002/03. Combined with a target to grow the Division's revenue to \$21m in the same period, this highlights the need to effect a significant change from the mindset of a research institute to that of a research enterprise. Issues of customer focus, commercialisation and business development are among the five areas identified in the staff poll as opportunities for improvement. Implementation of all staff poll follow-up recommendations is a key People Development issue. In the current climate, ongoing management issues such as leadership development, career planning, occupational health, safety and environment and equal opportunity considerations have particular significance. Equally apparent is the need to strengthen management processes around science and business prioritisation and project review. This is partly in response to corporate initiatives such as Project Management Improvement but it is also driven by two divisional imperatives: the need to eliminate deficit spending patterns and to ensure that key platform technologies are resourced.

The Chief's term will expire during 2002/03.

Strategies

Strategies to anticipate and respond to these contextual challenges include the need for growth derived from an analysis of our business portfolio and the cultural shift from an R&D institution to an R&D enterprise. Specifics include:

- Change in the current investment portfolio to reflect a 7% decrease in Strategic expenditure, a 12% increase in Co-Investment Income, 20% increase in Service Income and a \$500k target for applied technologies revenue.
- Appoint a senior level cultural change person at Parkville to lead the Divisional People Development function and promote business focus:
- Finalise the current review of Divisional operational structure and implement changes in order to: Free senior staff to manage external and internal interactions and to give leadership to senior management initiatives; Respond quickly and effectively to resource allocation scenarios such as the phasing-in of flagship projects; Facilitate internal communication flow; Give greater empowerment to staff at early to mid career stage; Enhance the emphasis on staff development by increasing training; and Create opportunities across programs.
- Develop and conduct training programs to foster business development, skills and customer focus.
- Implement Project Management Improvement including effort logging by December 2002.
- Provide formal company directors' training for all staff serving on Boards or Boards of Management.

- Promote industry secondments and develop and conduct training programs, lectures and courses to foster business development skills.
- Put in place a program to monitor and facilitate staff career path development.
- Implement the recommendations of the Staff Poll focus groups, especially to assist cultural and structural change processes.
- Ensure that OHSE issues are included as priority items at management meetings and implement an awareness-raising program.
- Ensure that Equal Employment Opportunity Officers work with staff to increase awareness of workplace diversity issues and ascertain training needs.
- Arrange structural biology activities around the NeuroBiotechnology Centre of Excellence if proposal is successful and explore positioning within the Preventative Health flagship project if it is not.
- Ensure the appointment of a senior scientist to the Synchrotron Steering Committee.

Planned Achievements (by Sector)

Division-wide planned achievements include: Shift in investment portfolio; Three comprehensive reviews of all projects; Senior Change Manager appointed; Project Management Improvement introduced; Introduction of effort-logging; Staff secondment and training implemented; Focus on operational structure; and Implementation of OHSE and EEO awareness.

Agribusiness

Preventative Health

This research is aimed at identifying food-related bioactives, increasing our understanding of consumer health-related behaviour and development of products for prevention of chronic diseases and cognitive decline. Expected achievements:

- Completion of 2 studies on dietary composition and weight loss/strategic.
- Development of IP position for novel biomarker for bowel health.
- Demonstration of the health benefits of grain-based product/commercial partner.
- Development of IP position for new grain product/CSIRO collaboration.
- Completion of ten clinical trials for food/nutrition industries.
- Completion of two projects within NEP Program.
- Undertake fee for service research for international partner.
- Completion of preclinical and clinical study for *Starplus*.
- Development of methodology for individual perceptions of risk/strategic.
- Undertake fee for service research in diet and cognition for commercial partner.
- Completion of two studies on role of aging and sensory factors in diet, including one for commercial partner.

Health

Diagnostics

This research aims to develop new assays and reagents and to identify biomarkers utilising protein engineering and proteomics. Expected achievements:

- Development of diagnostic generic technologies/CRC partnership

- Development of two classes of biochips (a) by protein and riboplex display/commercial partner and (b) receptor-based display membrane technology/IP position.
- Development of new proteins and mutational strategies/commercial partner.
- Development of an IP position around genome stability/commercial partner.
- Validation of recombinant multimeric antibodies/commercial partner.

Therapeutics Discovery

This research is based on an understanding of protein structure to identify potential therapeutics targeted towards large markets with unmet medical needs. Expected achievements:

- Discovery of lead compounds for IL-6 receptors.
- Characterisation of variant-I/business plan.
- IP secured for virus and variant-I/business plan.
- Commercialisation of RSVG protein inhibitors
- Construction of an *in silico* protein simulation engine to study neurodegenerative diseases
- Discovery of lead compounds for IGF_R/commercial partnership.
- Discovery of lead compounds for EGF_R/CRC partnering.
- Establishment of the feasibility of mutant ligand-based analogues as inhibitors of the insulin-like growth factor receptor for anti-cancer/partnership/securing IP.
- Atomic resolution X-ray diffraction data obtained on insulin receptor.
- Revenue in fermentation increased by way of contracts.

Resources, Revenue and Expenditure Profiles

Resources Summary 2002-03

Total Revenue	\$m	22.606
- Research & Services (R&S)	\$m	6.685
- Other External	\$m	0.025
- Direct Appropriation	\$m	14.677
- CSIRO-wide Services	\$m	1.219
R&S Earnings Ratio (R&S/Total Revenue)	%	29.6
Operating Result	\$m	1.868
End of Year Cash Balance	\$m	2.121
Research Staff (full time equivalent)	no.	120
Total Staff (full time equivalent)	no.	164

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	3.675
Research Services, Consulting and Testing	\$m	2.300
Intellectual Property	\$m	0.525
Sub-Total (Invoiced Revenue)	\$m	6.500
Work-in-progress / Deferred Revenue	\$m	0.185
Total	\$m	6.685

Customer Profile *

Australian Private Sector	\$m	2.275
Research and Development Corporations	\$m	0.450
Australian Governments	\$m	0.350
Cooperative Research Centres	\$m	1.350
Overseas	\$m	1.550
Total	\$m	5.975

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Health	%	68.7
Agribusiness	%	31.3
Total	%	100

Focus

CSIRO Land and Water is seeking solutions to complex land and water management problems. Our focus is on the delivery of innovative solutions to large-scale natural resource management challenges. We provide world class science services specialising in research on soil, water and atmospheric processes essential to the understanding and sustainable management of land and water resources. The Division has strategic linkages to environmental policy units, government agencies, water corporations, agribusinesses, industries, primary producers, land managers, catchment and regional groups.

Context

The Division will provide timely advice - based on quality science - to ensure the development of sound natural resource management policies. This will be achieved by improving the understanding of biophysical, social and economic processes of Australian landscapes and water resources, and through continuing dialogue with Commonwealth, State and Territory agencies, private companies with the mandate for natural resource management, and other CSIRO Divisions.

Our external business environment continues to be strongly shaped by the Research and Development Corporations and the CRCs. The Division has partnerships in thirteen CRCs with 3 new major CRC bids currently being developed. Within Australia the shift in the taxation base to the States will mean increasing funding opportunities at the state level relative to the Federal level and will require an increased focus on developing and maintaining improved State relationships. Maintaining the regional presence of the Division is essential to these relationships. Globalising markets present an opportunity for the Division to strengthen its international presence – for example through its existing World Bank, ACIAR and other commercial contacts.

Strategies

In 2001, the Division embarked on a major strategic initiative "CLW in C21", based on the results of a BIOSS evaluation of our existing work levels and management arrangements. We identified a need to refocus the Division's science, management, and culture to provide more head space for scientists to undertake strategic research to address emerging issues, to address gaps in strategic business development activity, and to ensure that the Division has the correct mix of skills appropriately targeted to meet the increasing challenges of the external environment. Three new senior Business Directors have been engaged to focus on strategic business development initiatives.

Reviews of two major areas of science have been conducted – Catchment Science and Contamination Remediation. The results of these reviews have helped guide the development of new science directions. Similarly the results of the Insight 2001 Staff Opinion Poll provide key drivers for change.

In parallel the Division is developing its Strategic Business Development Plan to provide a market-responsive growth platform for CLW in C21. The Division is also establishing β-Environmental Technologies International, a commercial company model, to provide a more focused and enabling environment for commercialisation of the Division's technology.

The Division will be a major contributor to the Healthy Country Flagship Program and will actively pursue its development and implementation to provide a strategic science growth platform for the Division. It is a key participant in two major Emerging Science areas – *Complex Systems Science*, and *Social and Economic Integration* and continues to actively grow its scientific base through initiatives such as the CSIRO Federation Fellowships, Postdoctoral Fellowship Program and PhD Program.

The Division's finances remain strong, enabling a capital investment and renewal program to be undertaken. 2002 – 2003 investments will be targeted to support the Division's Strategic Action Plan and Strategic Business Development Plan.

Planned Achievements

Many of the achievements listed below are shared across Sectors (especially Natural Resource Management and Environment, and Agribusiness).

New Methodology for Audits of Drinking Water Supply Catchments

- Completion in 2002 – 2003 of a new methodology for conducting audits of drinking water supply catchments.

National Action Plan for Salinity and Water Quality

- Delivery of a powerful new software tool - called EMSS - to assist regional groups with decisions and detailed calculations of nutrient and sediment delivery to coastal environments from regional catchments. This tool has been developed by CSIRO Land and Water researchers in conjunction with the CRC for Catchment Hydrology and will be extremely useful for regional managers involved in the National Action Plan for Salinity and Water Quality. New research by CSIRO Land and Water researchers has come up with a way to pinpoint the areas which are contributing the most sediment to rivers – so remedial action can be taken to repair them. This technique - called Sednet - uses a combination of geographical information system modeling and isotope analysis to identify which parts of the catchment are adding the bulk of the sediment load to the river. This technique will be useful as we will be able to target the 'hot spots' that require remedial action. This information will be incorporated into the EMSS software tool in 2002 - 2003.

Lower Murrumbidgee

- Further development of a range of innovative hydrologic, integrated hydrologic economic and community education tools commonly known as SWAGMAN (Salt, WAtter and Groundwater MANagement models) for natural resource management. These models and community participation activities can be readily adapted for use in other parts of the world and facilitate technology transfer.
- The Lower Murrumbidgee Catchment is a catchment under competing water uses and environmental and economic concerns in an arid zone which are similar to many other catchments in the world and provides an excellent example of community involvement in hydrological research and development of integrated catchment management policies using a range of tools.

Water Recycling Initiatives

- Further development and implementation of aquifer storage and recovery technology – an innovative method of storing water underground during times of excess to recover at a later date when needed or required.

National Land and Water Resources Audit

- Completion and communication (via workshops and briefings) of all projects conducted for the first ever Australia wide assessment of Australia's land and water resources. Delivery of outputs from CSIRO Land and Water to four of the seven National Land and Water Resources Audit themes (dryland salinity; land use productivity and sustainability; costs of land and water degradation; capacity for change in land use; river; estuarine; and catchment health).

Acid sulfate soils

- Maps identifying areas at risk from acid sulfate soils in Australia will be completed in 2002 – 2003. Acid sulfate soil environments have the potential to degrade landscapes and contribute to poor water quality. This work will help land managers and policy makers.

Commercialisation

- There are also several projects at various stages of commercialisation including hyperspectral remote sensing technologies, innovative wind energy technology called Windscape, and new techniques for filtering and irrigating crops from land treatment and effluent re-use called the FILTER system which is helping to turn effluent into an asset.
- Significant progress will be made on several other technologies in 2002–2003 through internal incubation and assessment via β-Environmental Technologies International, a commercial company model, to provide a more focused and enabling environment for commercialisation in the Division.

Heartlands – Sustainable Land Use in the Murray-Darling Basin

- *Heartlands* is an innovative long-term program combining on-ground-works with research and development. It has a strong focus on salinity, water quality, water yield, biodiversity and carbon sequestration potential. This initiative is identifying solutions that integrate social and economic objectives with biophysical research for rural communities in the south east Murray-Darling Basin.

- During 2002 - 2003, analyses of selected sub-catchments will be undertaken to assess the effectiveness of revegetation options for salinity control. Recharge targets will be specified. Ecological design principles will be extended to enhance biodiversity and ecosystem function. Methods for integrating this knowledge will be developed to enable recommendations for land use change. A monitoring program to evaluate the effectiveness of new salinity control measures will be established. The feasibility of a mosaic farming system that delivers salinity control, biodiversity gains and financial viability will be investigated. This is a highly successful participative mode of research and aims to provide efficient strategies for landscape rehabilitation through targeted revegetation and redesigned agricultural systems.

Resources, Revenue and Expenditure Profiles

Resources Summary 2002-03

Total Revenue	\$m	53.845
- Research & Services (R&S)	\$m	19.380
- Other External	\$m	0.291
- Direct Appropriation	\$m	31.271
- CSIRO-wide Services	\$m	2.903
R&S Earnings Ratio (R&S/Total Revenue)	%	36.0
Operating Result	\$m	(0.648)
End of Year Cash Balance	\$m	7.274
Research Staff (full time equivalent)	no.	310
Total Staff (full time equivalent)	no.	452

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	18.250
Research Services, Consulting and Testing	\$m	0.780
Intellectual Property	\$m	0.050
Sub-Total (Invoiced Revenue)	\$m	19.080
Work-in-progress / Deferred Revenue	\$m	0.300
Total	\$m	19.380

Customer Profile *

Australian Private Sector	\$m	2.474
Research and Development Corporations	\$m	4.558
Australian Governments	\$m	9.144
Cooperative Research Centres	\$m	1.903
Overseas	\$m	0.952
Total	\$m	19.030

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Natural Resources Management & Environment	%	80.6
Agribusiness	%	11.0
Mineral Resources	%	6.3
Energy & Transport	%	2.1
Total	%	100

Focus

CSIRO Livestock Industries (CLI) works in the major temperate, Mediterranean and tropical production zones of Australia. CLI comprises highly-skilled staff in specialised field and laboratory facilities at Armidale in New South Wales, Rockhampton and Brisbane in Queensland, Perth in Western Australia and Geelong in Victoria. We assist livestock and allied industries to be economically viable, ecologically sustainable and capable of contributing to the social and natural resource objectives of the nation through maintaining Australia's freedom from the major endemic diseases of livestock. We aspire to be a national leader and a global force in research, creativity and innovation for all aspects of livestock production systems.

Context

CLI's research is primarily conducted for the Meat Dairy and Aquaculture industries and the Textiles Clothing and Footwear industry.

We earn 80% of our external revenue from 20 customers. Our largest single customer is Agriculture, Fisheries and Forestry Australia AFFA, with which we have a strategic alliance in the operation of the Australian Animal Health Laboratory (AAHL) in Geelong. Other major customers are the rural research and development corporations, representing livestock (and other) producers and the federal government; the federal government through its CRC and foreign aid programs; animal health companies; and companies engaged in livestock production and allied industries.

Presently our focus is on the domestic market, where our main competitors are universities, state departments of agriculture and AgResearch (New Zealand). Our competitors in the international market include other research organisations and tertiary institutions throughout the USA and Europe. Of course, competitors are also potential collaborators and we have established collaborations with many of these organisations, often through the CRC program in the case of Australian organisations. The Division also has current alliances under cover of agreements with INRA (France), VIDO (Canada), Moredun (UK) and USDA-ARS (USA), which will be further developed.

Strategies

The Division is committed to achieving a growth in its annual revenue and value of equity by between \$25.2 and 31.2 million (49-60%) above year 2001-02 levels. Growth is anticipated in appropriation, external commercial revenue and valuation of shareholdings. Growth at the higher rate is dependent on CSIRO succeeding in securing new investment (ie over and above normal supplementation) from federal government. We will achieve this growth by:

- Supporting corporate efforts to demonstrate to government that the economic, environmental and social benefits of R&D to the agribusiness sectors represent an attractive return on investment.
- Participating actively in corporate initiatives to establish strategic, high-value relationships with large international companies.
- Commercialising that part of our IP portfolio comprising technology for the production of animal and human health products through a combination of licensing and new enterprise creation.
- Increases in operational effectiveness and efficiency and cultural change, freeing up and increasing the mobility of resources for allocation to high value R&D projects.
- Partnering with research organisations that will help us gain access to new markets.
- Investing more resources in the development of our relationships with important current and potential customers, co-ordinating these efforts with those of other Divisions.
- Entering into service relationships with organisations that could benefit from outsourcing their R&D.
- Securing investment from special interest groups in projects directed to improving the environment, enhancing animal welfare and creating other perceived social benefits.

Planned Achievements (by Sector)

Agribusiness

- Further develop research capabilities in functional genomics and systems approaches to cattle production by participation in co-operative ventures, including an international genome sequencing initiative.
- Improve control of meat quality through breeding plans based on advanced genetic technologies, with anticipated commercialisation of a new gene marker for tenderness.
- Genetic information delivered to industry via innovative web based and licensing mechanisms.
- Continued genetic improvement of freshwater crayfish and exploration of polyculture options.
- Swift diagnosis and investigation of exotic diseases and rapid, efficient participation in managing animal and fish disease outbreaks of national significance, including development of increased FMD diagnostic capability.
- Participate in international event testing FMD preparedness.
- Advise Government and related agencies on livestock industry policy development and implementation.
- Commencing basic research on mucosal immunology with a long term view of addressing major livestock diseases including Johne's Disease and gastro-intestinal parasites.
- Further commercialise Corynetoxin ELISA technology, involving transfer of technology to rural industries analytical laboratories.
- Continuing preliminary toxicity studies for tunicamycin to determine the no observable effect limit for corynetoxin levels in grain and fodder samples.

Manufacturing

- Working with the new Australian Sheep Industry CRC to develop robust analytical systems that underpin a national sheep genetic evaluation system.
- Continued enhancement of a novel procedure to prevent breech strike in sheep.
- Commercial evaluation of novel products and techniques for formulation of bioactives to livestock (also Meat, Dairy and Aquaculture).
- Complete analysis of data to detect quantitative trait loci of economic importance for sheep production.
- With Textile and Fibre Technology, evaluate processing performance of ultra-fine wool.
- Study the impact of grazing saltland pastures on water use, ecosystem and sheep performance.
- Commence pilot trial to provide weekly pasture growth rates to livestock producers in Mediterranean regions of Australia.

Natural Resource Management and Environment

- Commence research in cattle to identify a potential vaccine to reduce methane production.

Resources, Revenue and Expenditure Profiles

Resources Summary 2002-03

Total Revenue	\$m	76.599
- Research & Services (R&S)	\$m	23.431
- Other External	\$m	0.562
- Direct Appropriation	\$m	48.475
- CSIRO-wide Services	\$m	4.131
R&S Earnings Ratio (R&S/Total Revenue)	%	30.6
Operating Result	\$m	(2.583)
End of Year Cash Balance	\$m	8.691
Research Staff (full time equivalent)	no.	278
Total Staff (full time equivalent)	no.	479

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	18.799
Research Services, Consulting and Testing	\$m	1.637
Intellectual Property	\$m	2.555
Sub-Total (Invoiced Revenue)	\$m	22.991
Work-in-progress / Deferred Revenue	\$m	0.440
Total	\$m	23.431

Customer Profile *

Australian Private Sector	\$m	5.448
Research and Development Corporations	\$m	2.459
Australian Governments	\$m	7.910
Cooperative Research Centres	\$m	2.886
Overseas	\$m	1.733
Total	\$m	20.436

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Agribusiness	%	74.4
Manufacturing	%	20.0
Natural Resources Management & Environment	%	3.1
Health	%	2.5
Total	%	100

Note: The Division of Manufacturing and Infrastructure Technology was formed on 1 July 2002 from the merger of CSIRO Building, Construction and Engineering with CSIRO Manufacturing Science and Technology. The merger is designed to significantly enhance CSIRO's research delivery capacity by capturing important synergies that result from complementarity in the science base and from growing overlap in the markets served by the two former Divisions. The following entries were prepared prior to the announcement of the merger by the Chief Executive on 20 June 2002.

Building, Construction and Engineering - Focus

Our purpose is to provide the best research based technologies and solutions to our stakeholders. That research is focussed into three core capabilities Thermal & Fluids Engineering, Sustainable Materials Engineering and Infrastructure Systems Engineering. Within Thermal & Fluids Engineering we are working in the emerging science areas of complex systems, biomedical technology and microfluidics. In Sustainable Materials Engineering our planned growth is in nanotechnology. In particular, we will continue our work in nanocomposites. We will also continue to strengthen our capability in Infrastructure Systems Engineering, particularly transportations systems and life cycle infrastructure asset management.

Context

Our portfolio has been created to address national priorities and the major issues impacting on our markets. Examples of these include the focus on asset management and sustainability to address the issue of deteriorating infrastructure raised in *The State of the Environment Report 2001*. The importance of the division's work in recycling and cleaner production is endorsed by the March 2002 Discussion Paper *Setting R&D Priorities for Australia's Future* as having "... very high potential, not only in breakthrough research, but also in refinement of existing technologies...".

The need to give greater consideration to environmental factors and adopt triple bottom line principles is addressed by our work in embodied energy of infrastructure and transportation systems. We are also required by the market to adopt a systems thinking approach to our research. Our work in lifecycle costing and transportation uses this emerging area to maximise the sustainable returns on investment overall. Building Construction & Engineering is also collaborating across CSIRO on complex systems and ICT research and continues to make considerable contributions to the nanotechnology and integrated social and economic science efforts. The Division is also active globally, establishing credentials worldwide and contracts within the European 5th and 6th Framework Programmes.

Strategies

Strategic initiatives include:

- Globalisation and partnerships. We are progressing our relationship with BHRG in the UK and SFRI in China.
- Positioning of Fire Science Research. The construction of the new Fire Science & Technology Laboratory at North Ryde and the successful recruitment one of the world's leading fire scientists, Dr. David Yung as the Director, will cement CSIRO's position as a world leader in fire science research and technology.
- Realignment of Consulting and Services activities. Our newly appointed General Manager of Consulting and Services is employing a strategy that will improve our customer relations and result in the reinvestment of proceeds from Consulting and Services activities back into strategic research. Part of the strategy is to form stronger partnerships with industry and we are currently in discussion with Arups.
- In Technology and IP Exploitation, PST Pty Ltd the spin-off company for our SICOR technology has been incorporated and commercialisation of the technology will now move quickly. Following SICOR in the technology pipeline are Pulse Combustion Technology, Swirling Flow Technology, Low Energy Accelerated Processing, New Metallic Coatings, Rotary Arc Mixer. The commercialisation strategy is to fast track these technologies into industry.

- In the area of co-investment we are moving to larger contracts with clients and focussing on servicing major/key clients. Boeing is an excellent example where we have built one successful project into 3 projects with the opportunity for more in the coming year.
- Continuing support for the Flagship Programmes which include contributions to Preventative Health, Healthy Country, e-Australia, Light Metals and Energy Transformed.
- Increased focus on establishment of research alliances including renewal of our collaborative research agreement with Queensland University of Technology (QUT) and our participation in the CRCs for Construction Innovation and Innovative Wood Products.

Planned Achievements (by Sector)

Natural Resource Management and Environment

- In 1999/2000 Australian water authorities spent \$289M on renewal or replacement of water and sewerage pipelines. BCE will continue the development of a suite of tools to allow planning and prioritisation of pipeline replacement. Version 1 of one of these asset management tools, Pipeline Asset and Risk Management System (PARMS), will be completed and licensed to a water authority to facilitate technology transfer.
- BCE will focus on two new technologies for air cleaning; the use of plasma for removal of gases and particles and engineering solutions for Legionella prevention.

Information Technology and Application

- The Institution of Engineers has predicted that Australia must spend up to \$40 billion to bring its infrastructure to an acceptable standard. In the absence of tools for infrastructure management BCE will begin work on a generic decision support system for infrastructure asset management.
- System integration involving a convergence of technologies (object based CAD with inter-operability capabilities), performance-based design and environmental sustainability drivers will lead to development of software tools for automated assessment of building performance.

Energy and Transport

- A pilot "FAST" (Freight Assignment Synergy Tool) software tool for SME's to better plan freight movements is planned for completion before financial year 2004. Currently this exercise is done manually with an estimated 70% of "return journeys" made without a load. FAST will improve the efficiency of small operators, reduce the number of heavy vehicles on our roads and contribute to significant improvements in road safety.

Manufacturing

- Research into the behaviour of cellular solids will pursue the development of new classes of adaptive material, which are breathable, carbon absorptive, and responsive to extreme loads. These will offer amongst other advantages, impact, blast and fire resistant characteristics. This class of new materials to be identified by 2004 financial year.
- A wood-plastic composite offering valuable physical properties has been produced utilising recycled materials. BCE is currently working with an industrial partner to prove the material for manufacture using standard equipment, which if successful, will result in a significant contract for technology transfer.
- BCE has developed a treatment technology for creating corrosion resistant metals. This technology creates a coating that has a prolonged life and is non-toxic. This will be developed to a commercial ready prototype by 2004.

Mineral Resources

- Scale formation is a very significant worldwide problem affecting industries including the minerals processing, mining, power, water and petro-chemical industries. The costs associated with scale formation its prevention and remediation is estimated at US\$45b per annum. BCE will facilitate a cross-divisional project to provide a solution.

CSIRO Manufacturing and Infrastructure Technology

- BCE made news worldwide with its RAM (Rotary Arc Mixer). The RAM is a device that mixes viscous fluids more efficiently and with less shear than currently available technology. This year BCE will enter the commercialization stage of development and build a commercial prototype.

Manufacturing Science and Technology - Focus

CSIRO Manufacturing Science & Technology creates benefit for Australia through R&D and innovation focused on manufacturing industry. Its research strategy is concentrated in: light metals, nanomanufactured systems, production systems and sustainable manufacturing systems. These directions are underpinned by research in joining, forming and casting technologies, light alloys, surface engineering, microtechnology, nanotechnology, polymer technology, x-ray and synchrotron science, automation & control, manufacturing systems and energy & environment technology. These areas are continuously monitored to ensure a significant impact aligned with major government and organisational strategic aims. Strategic partnerships with other research providers and companies are developed and sustained to address large scale or complex research opportunities.

Context

There is an environment of rapid change within CSIRO and an increasingly complex external environment, where national boundaries are more permeable and the activities of our competitors more internationally oriented.

There has been a significant decrease in capital investment and research and development in manufacturing within Australia over the past 2-3 years. Companies are looking globally to source their research and development requirements.

The Division's growth aspirations as well as those in the CSIRO Strategic Action Plan demand that we are more international in our endeavours, and more diligent in seeking opportunities for new business models in a partnering thrust. National and state government science and technology priorities have natural alliances with the areas of concentration of our research direction and our business development eg nanotechnology, the synchrotron and light metals. The Division has a program to pursue enhanced collaboration with local and international institutions to expand our influence in strategic growth areas

Environmental sustainability is a driving force throughout manufacturing industries. There is a highly competitive international environment from which to attract and retain quality staff.

The Clayton East refurbishment project will result in the consolidation of the Division's Melbourne based activities at Clayton by early 2004.

Strategies

The Division will continue to implement and consolidate its research delivery strategy based around projects and will assess the effectiveness of the structural changes made to effect this strategy. It will be supported by a project management system developed in-house to take the Division forward until the implementation of a CSIRO-wide system.

A strategic research panel has been established that will maintain an investment approach for development of strategic research and ensure alignment with the Division's strategic directions and CSIRO policy and initiatives. Divisional business development strategy and teams are being restructured to enhance performance and accountability for commercial development in the four major strategic research directions.

The Division will have a significant role in the Light Metals Flagship Program, with likely minor involvement in the Energy Transformed, Wealth From Australia's Oceans, and Preventative Health Flagship Programs.

In Light Metals and Production Systems, where there is a mature science base, the Division will maintain a strong co-investment position with industry and focus its strategic investment on specific opportunities with high IP potential. In Sustainable Manufacturing and Nanomanufactured Systems strategic investment will increase to develop both a strong IP position and science base.

The Division will be a leader in CSIRO Automotive, an initiative to engage the automotive industry in long term, multi divisional research and development. Initially companies and their needs will be assessed against CSIRO's capabilities.

Victorian Science and Technology Infrastructure (STI) initiatives, nanoVIC Ltd and VCAMM (Victorian Centre for Advanced Materials Manufacturing) are expected to be approved under STI-II. Work towards forming these entities will continue at that time.

Participation in new CRCs in Advanced Vital Imaging and in Titanium is being planned, as is participation in the existing CRC for Wood Innovation. The CRC for International Food Manufacture and Packaging Science will cease in 2002. With the CRCs CAST Metals Manufacturing, Welded Structures and Intelligent Manufacturing Systems and Technologies an integrated international marketing capability in metals manufacturing R&D is being developed.

The Division will continue to support the incubation of ATM Casting Technologies, Join Technology and Plantic, all of which are based upon IP developed by the Division either alone or in collaboration with CRC partners.

Innovation and research support will continue for XRT Pty Ltd, a spin-off company formed in 1998 to commercialise phase contrast X-ray imaging technology.

Planned achievements (by Sector)

Manufacturing

- Finalisation of significant commercialisation opportunities:
 - ATM die casting technology for magnesium and aluminium.
 - Advanced heat treatment for aluminium alloys.
 - Wear resistant polymers.
 - First commercial release of cerate conversion coatings technology with Chemetall.
 - Development of novel welding technology in a joint venture with the CRC for Welded Structures.
- Complete feasibility study for magnesium sheet production by twin roll casting and engage an industrial partner for commercialisation of the technology.
- Develop technologies to improve die casting performance:
 - Prevention of die soldering.
 - Alliance with die casting manufacturers for commercial development of advanced shot monitoring and defect diagnostics technology.
- Development of technology for in situ repair of turbine blades.
- Development of a pre-commercial software package to support HYMOD high-speed image processing technology.
- Development of hard tooling technology for embossing high security microstructure in metals and production of the Year of the Outback coin.
- Develop a platform of technologies using deep microstructures for a range of applications.
- Development of a commercial novel switching array technology in conjunction with CRC for Microtechnology.
- Demonstration of a remediation technology for domestic plumbing systems affected by blue water corrosion.
- Scale up and commercialisation of biodegradable trays for food packaging with commercial partner.
- Tailored development of nanoparticles with specified optical properties.

CSIRO Manufacturing and Infrastructure Technology

- Completion of feasibility project for designer performance membranes for a range of applications.
- Commercial support of pilot scale demonstration of waste water remediation technologies.

Mineral Resources

- Finalisation of the extended development stage of the autonomous LHD vehicles technology for underground mining.

Resources, Revenue and Expenditure Profiles (Combined Divisions)

Resources Summary 2002-03

Total Revenue	\$m	77.295
- Research & Services (R&S)	\$m	24.842
- Other External	\$m	0.337
- Direct Appropriation	\$m	47.948
- CSIRO-wide Services	\$m	4.168
R&S Earnings Ratio (R&S/Total Revenue)	%	32.1
Operating Result	\$m	0.347
End of Year Cash Balance	\$m	5.988
Research Staff (full time equivalent)	no.	362
Total Staff (full time equivalent)	no.	482

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	16.945
Research Services, Consulting and Testing	\$m	6.592
Intellectual Property	\$m	1.200
Sub-Total (Invoiced Revenue)	\$m	24.737
Work-in-progress / Deferred Revenue	\$m	0.105
Total	\$m	24.842

Customer Profile *

Australian Private Sector	\$m	13.331
Research and Development Corporations	\$m	
Australian Governments	\$m	5.595
Cooperative Research Centres	\$m	2.746
Overseas	\$m	1.865
Total	\$m	23.537

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Manufacturing	%	60.0
Natural Resources Management & Environment	%	15.0
Mineral Resources	%	9.2
Energy & Transport	%	8.9
Information, Communication & Services	%	6.9
Total	%	100

Focus

CSIRO Marine Research (CMR) employs an integrated and multidisciplinary approach to explore and understand the marine system and its relationship to the climate system, the terrestrial environment and utilisation of marine resources. Our work identifies the key biological, chemical, physical and socio-economic processes that influence the health and productivity of marine ecosystems, and improves our ability to predict changes to the marine and terrestrial environment. Our work is undertaken in partnership with other research institutions, managers and key stakeholders to foster and promote the ecologically sustainable development of Australia's ocean and terrestrial resources.

Context

Our oceans are a public domain, with many activities competing for access. Pressures on the ocean from land and offshore activities are considerable, and increasing. By 2004, the combination of Australia's 200-mile limit and extensive 'claimable continental shelf' will mean that over 60% of Australia's territory is under the ocean.

The challenges we face as custodians of the world's largest and most diverse Exclusive Economic Zone are daunting in scope. We have an obligation to understand, preserve and utilise the vast potential wealth of our ocean territory in a responsible and sustainable manner.

To use our resources most effectively, we must understand the needs of our stakeholders, work with other key science providers and improve our business operations. This will be a major challenge in 2002-03 as we finalise a Strategy for Focus and Growth for 2002-2007 and implement a research portfolio that our stakeholders consider appropriate to the meeting of Australia's needs, while being widely owned, and acknowledged, within CSIRO.

Other significant events that will impact on CMR in 2002-03 are: the appointment of a new Chief; implementation of a new research delivery structure; and the transfer of the RV Southern Surveyor into the National Facility program to provide a more effective and efficient research platform for all marine research institutions. Also the Commonwealth Government will continue to implement Australia's Oceans Policy and will commence a process to develop a National Coastal Policy.

Strategies

In response to this context CMR will:

- Collaborate with key marine science organisations and across CSIRO to develop a national flagship program to stimulate the development of ecologically sustainable marine industries through understanding our marine resources and environment. Our aim is to significantly increase the wealth generated by marine industries and assist Australia to confirm sovereignty over our marine territories.
- Consult widely and implement a Strategy for Focus and Growth (2002-2007) to focus on, and grow five areas of research: Sustainable Marine Ecosystems; Sustainable Fisheries; Sustainable Aquaculture; Climate Processes and Climate Prediction; Marine Environment Prediction.
- Improve our structure and systems to enhance: science delivery through fewer, larger, well managed and better resourced projects; strategic people management and effective career management; strategic relationship management through improved client management and market analysis.
- Maintain and develop alliances with key science partners through engagement in CRC's, international science programs, universities and with state research initiatives such as CSIRO's joint venture with the Western Australian government - Strategic Research Fund for the Marine Environment.
- Provide advice to the commonwealth and state governments on the development of the National Coastal Policy.

Planned Achievements (by Sector)

Natural Resource Management and Environment

- Habitat and ecosystem maps and interpretation for regional marine planning in the SE Region, Great Barrier Reef, Gulf of Carpentaria, Torres Strait, and NW Shelf and the development of optimal mapping and habitat classification techniques.
- Models that link the biophysical dynamics and the impacts of human use in selected ecosystems to assist regional marine planning.
- Improved stock assessments and catch predictions in the Northern Prawn, Southern Bluefin Tuna and Indian Ocean Tuna fisheries.
- Development and evaluation of sustainable harvest strategies for fisheries and continued development of the National framework for reporting the ESD performance of fisheries.
- Ecological risk assessments for Commonwealth fisheries for input to Strategic Assessments under the EPBC Act; and evaluation of strategies to minimise the environmental impacts of fishing on ecosystems, habitats and species.
- Develop joint management strategies with Indonesia for shared fish stocks, notably snappers, tunas and sharks.
- Baseline data and pilot predictive models for impacts of river flow and catchment loads on the Ord Estuary, and for salmon aquaculture on the Huon Estuary and D'Entrecasteaux Channel.
- Develop genetic constructs for the control of aquatic pest populations of mosquito fish and carp.
- Operational implementation of the jointly developed Predictive Ocean Atmosphere Model for Australia (POAMA) at the Bureau of Meteorology, applications to address seasonal climate impacts, and experiments using model and observations to understand the role of ocean circulation (Indonesian Throughflow, Indian Ocean Dipole, Intraseasonal Oscillation).
- Advanced statistical and dynamical analysis to improve understanding of ocean-climate processes (overturning circulation, heat transports, carbon content, diapycnal mixing, role of eddies in general circulation).

Agribusiness

- Commercial scale domestication and selective breeding of Kuruma prawn and Pacific oyster. Initiate the domestication of disease-free black tiger prawns.
- Diet development for grow out of rock lobsters and selected tropical groupers.

Resources, Revenue and Expenditure Profiles**Resources Summary 2002-03**

Total Revenue	\$m	38.784
- Research & Services (R&S)	\$m	12.464
- Other External	\$m	0.239
- Direct Appropriation	\$m	25.990
- CSIRO-wide Services	\$m	2.091
R&S Earnings Ratio (R&S/Total Revenue)	%	32.1
Operating Result	\$m	(0.797)
End of Year Cash Balance	\$m	13.819
Research Staff (full time equivalent)	no.	197
Total Staff (full time equivalent)	no.	289

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	10.286
Research Services, Consulting and Testing	\$m	2.178
Intellectual Property	\$m	0
Sub-Total (Invoiced Revenue)	\$m	12.464
Work-in-progress / Deferred Revenue	\$m	0
Total	\$m	12.464

Customer Profile *

Australian Private Sector	\$m	0.505
Research and Development Corporations	\$m	3.337
Australian Governments	\$m	7.291
Cooperative Research Centres	\$m	0.915
Overseas	\$m	0.416
Total	\$m	12.464

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Natural Resources Management & Environment	%	59.2
Agribusiness	%	38.4
Health	%	1.0
Energy & Transport	%	0.7
Mineral Resources	%	0.7
Total	%	100

Focus

CSIRO manages the National Facility as a world-class ocean-going research platform on behalf of Australia's marine research community. Access to the National Facility is through a peer-reviewed, competitive process based on scientific excellence. Major costs of operation at sea are provided through the National Facility. CSIRO Marine Research provides specialized electronic, data processing, chemical analysis and technical services as part of the support provided by the National Facility.

Context

Australia's Oceans Policy identifies the need for exploration and information about the Exclusive Economic Zone, to support the sustainable development of the marine environment and its resources as well as climate and weather services, defence and safety at sea. The National Facility conducts deep-ocean research in support of outcomes articulated in *Australia's Ocean Policy*. Marine geoscience is an area of increasing activity, with specialised equipment needs.

2002-2003 will see the transfer of the CSIRO research vessel *Southern Surveyor* to the National Facility to replace the oceanographic research vessel *Franklin*. The change will improve Australia's ocean research capabilities as the *Southern Surveyor* will be able to support a much wider range of disciplines in: oceanography; marine geosciences; fisheries; and environmental disciplines.

The resources available to support Australian deep-water research have declined over the last decade in parallel to an increased need to define, understand and manage Australian marine and ocean resources. The transfer of *Southern Surveyor* is a pragmatic response to these changing Australian marine research demands and will improve Australia's capabilities to meet changing research demands through more flexible support of different research disciplines.

The move to the *Southern Surveyor* has only been undertaken after extensive consultation and is strongly supported by National Facility user groups and government policy and regulatory agencies. The move has been approved by the National Facility Steering Committee and the CSIRO Board and endorsed by the Minister for Science.

Strategies

An independent ministerially appointed Steering Committee oversees the operation and strategic planning of the Facility, and is supported by a Scientific Advisory Committee. The Steering Committee includes members from marine industries to foster greater involvement in the strategic management of the National Facility.

A Scientific Advisory Committee, comprising experienced researchers from major marine research agencies and universities with marine programs, provides technical and scientific advice to the Steering Committee, and reviews proposals for use of the National Facility.

The National Facility Steering Committee will continue to work closely with CSIRO and other research agencies and user groups to improve the effectiveness of deep-water research support services provided through the National Facility.

Planned Achievements (by Sector)

Natural Resource Management and Environment

- The effective management of the commissioning of the *Southern Surveyor* as the new National Facility vessel. The change will involve transfer of specialized equipment from the *Franklin* and modifications to *Southern Surveyor* to allow it to undertake a range of tasks across disciplines in:
 - Physical and chemical oceanography
 - Marine geosciences
 - Fisheries
 - Environmental
 - Multidisciplinary research

Oceanographic Research Vessel

- Southern Surveyor will commence operations as the National Facility early in 2003.
- Applications for research vessel time will be assessed and a cruise program implemented that provides support to Australia's universities and other major research agencies in marine geosciences and oceanography in Australian and regional waters.

Resources, Revenue and Expenditure Profiles

Resources Summary 2002-03

Total Revenue	\$m	6.830
- Research & Services (R&S)	\$m	0.150
- Other External	\$m	0.030
- Direct Appropriation	\$m	6.282
- CSIRO-wide Services	\$m	0.368
R&S Earnings Ratio (R&S/Total Revenue)	%	2.2
Operating Result	\$m	0.750
End of Year Cash Balance	\$m	(6.238)
Research Staff (full time equivalent)	no.	1
Total Staff (full time equivalent)	no.	8

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	0
Research Services, Consulting and Testing	\$m	0.150
Intellectual Property	\$m	0
Sub-Total (Invoiced Revenue)	\$m	0.150
Work-in-progress / Deferred Revenue	\$m	0
Total	\$m	0.150

Customer Profile *

Australian Private Sector	\$m	0.150
Research and Development Corporations	\$m	0
Australian Governments	\$m	0
Cooperative Research Centres	\$m	0
Overseas	\$m	0
Total	\$m	0.150

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Natural Resources Management & Environment	%	100.0
Total	%	100

Focus

CSIRO Mathematical and Information Sciences (CMIS) develops solutions in information technology, mathematics and statistics to benefit a range of industries. We are a major contributor to CSIRO's research effort in information and communication technologies (ICT) and ICT's application in many sectors. Our research focuses on electronic content technologies; services and technologies for the information economy; decision tools for service industries; mathematics and modelling for manufacturing and resources; environmental measurement and assessment; and imaging and bioinformatics. The application of our core skills to health services will be a major focus for the Division.

Context

A number of factors, both internal and external, have the potential to impact significantly on CMIS activities this year. The planned ICT Centre of Excellence and the economic environment for the ICT industry are expected to create opportunities for us (eg collaboration, recruitment opportunities), but may also create difficulties, particularly for recruitment and retention of high calibre researchers and software engineers. We will be working to make sure we capture benefits and minimise any negative outcomes. State Governments are increasingly investing in ICT initiatives, providing exciting strategic co-investment opportunities, a number of which have already begun.

CMIS is participating in an external review of ICT research, the outcomes of which may have a significant impact on the Division. We expect to be involved in a number of CSIRO Flagship Projects, playing a major role in at least 2, and have submitted a proposal to establish a Bioinformatics spin-off which, if successful, will have staffing and intellectual property management implications.

We expect to face significant accommodation constraints in our 3 major sites and will need to find solutions if we are to manage the planned future growth.

Strategies

The Division is implementing a number of new initiatives developed in response to key features in the CSIRO Strategic Action Plan. In order to improve focus and increase opportunities for growth, we have developed several major divisional goals, built around the CSIRO Flagship Projects, and a small number of major business directions aimed at bringing together various discipline skills to address issues of national importance. We have also established funding for new projects in areas of emerging science. These new initiatives will be the catalyst for increasing our recruitment of Post-Doc fellows and enhancing our current visitor program to attract leading overseas researchers. We will also need to develop strategies in response to outcomes from the review of ICT research in CSIRO.

New investment strategies will be adopted to enable us to support these initiatives and to create a balanced portfolio of activities across the Investment model domains.

If the Bioinformatics Spin-off proposal is approved within CSIRO, we will proceed to seek funding and establish the company.

CMIS has already actively embraced e-CIRO through participation in relevant taskforces and expects to continue this by being early adopters of e-CIRO strategies. We will have in place mechanisms for web-based delivery of services, handling all processes from the initial customer request through to web-based payment.

We will implement actions being developed to address key issues arising from the staff opinion poll, in particular those relating to leadership and pay. Competing in the recruitment market place has been difficult for CMIS and we expect to adopt elements of the proposed new corporate reward systems to assist us to recruit and retain high-calibre staff.

Information obtained from the Customer Value Surveys and the new Project Management arrangements will be used to improve the efficiency and effectiveness of our consulting and commercialisation processes. We will invest additional resources in targeted marketing and concentrate more effort on building key accounts to better focus our research and improve our industry engagement and commercialisation outcomes.

Planned Achievements (by Sector)

Health

- Substantial contribution to the Preventative Health Flagship Program.
 - More effective access to text-rich health information.
 - Statistical and data mining products, procedures and methods for assessing health risks and measuring cost effectiveness of alternative health programs and strategies.
 - IP in new architectures and integration algorithms for highly autonomous information systems.
 - At least 70 internal CSIRO databases on epidemiology, longitudinal studies of peoples' health, etc linked and made accessible internally with appropriate analytic tools.

Information, Communication and Services

- Methods, models and algorithms developed for Adaptive Supply Networks.
- Image analysis methods to support high throughput secondary screening in drug discovery.
- Release of commercial proteomics and functional genomics software incorporating and/or based on CSIRO technology.
- Three patents filed in novel aspects of genomic / proteomic data mining.
- Launch of start up company in Bioinformatics.
- Substantial contribution to the E-Australia Flagship Program by providing information technologies that combine with communication technologies enabling Australia to efficiently and effectively deliver a wide variety of services.
- Development of technologies (eg collaborative and information technologies) to support Australia in delivery of Expert Business Services.
- Independent, rigorous evaluations of mission-critical information technology products (including Middleware products) and software infrastructures and architectures.
- Completion of the CeNTIE testbed application for research into the impact that advanced networks will have on distributed computing. Advanced haptic demonstrators developed and tested.
- The development of Mobile Monitoring and Control Infrastructure to be deployed in applications such as environmental monitoring, smart buildings and the retail industry.

Natural Resource Management and Environment

- A draft joint venture proposal between the CSIRO and the Australian Greenhouse Office as part of the National Carbon Accounting System (NCAS) being developed with the AGO.
- For the Indian Ocean Climate Initiative, identify nonlinear interactions between broad scale climate indices for southwest Australia influencing the long-run rainfall decline.
- Report on a tagging study and projects in maturity and age structure in connection with activities for the Conservation of Southern Bluefin Tuna.

Manufacturing

- Models for predicting service life performance of distribution systems with an emphasis on urban water pipelines.
- Novel designs for a range of products, including mirrors, lenses, building materials and rheometers.
- A microstructure modelling capability, for the design and analysis of particulate materials.
- Strategies for increasing the value of export commodities, including coking coal and grain.
- Methodology that: provides improved modelling of High Pressure Die Casting, yields new methods of modelling mineral deposition processes, and allows us to model granular flow with complex shaped

particles. Commercialisation of High Pressure Die Casting software will be pursued in collaboration with CAST CRC.

Resources, Revenue and Expenditure Profiles

Resources Summary 2002-03

Total Revenue	\$m	34.852
- Research & Services (R&S)	\$m	11.992
- Other External	\$m	0.300
- Direct Appropriation	\$m	20.681
- CSIRO-wide Services	\$m	1.879
R&S Earnings Ratio (R&S/Total Revenue)	%	34.4
Operating Result	\$m	(1.942)
End of Year Cash Balance	\$m	3.674
Research Staff (full time equivalent)	no.	189
Total Staff (full time equivalent)	no.	267

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	5.611
Research Services, Consulting and Testing	\$m	6.282
Intellectual Property	\$m	0.107
Sub-Total (Invoiced Revenue)	\$m	12.000
Work-in-progress / Deferred Revenue	\$m	(0.008)
Total	\$m	11.992

Customer Profile *

Australian Private Sector	\$m	4.475
Research and Development Corporations	\$m	0.150
Australian Governments	\$m	4.976
Cooperative Research Centres	\$m	0.351
Overseas	\$m	1.941
Total	\$m	11.893

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Information, Communication & Services	%	66.2
Health	%	12.0
Natural Resources Management & Environment	%	10.5
Manufacturing	%	4.5
Mineral Resources	%	3.0
Agribusiness	%	2.0
Energy & Transport	%	1.8
Total	%	100

Focus

CSIRO Minerals provides research, development and commercialisation support for the mineral processing and metal production industry. The Division's science, engineering and technology skills and infrastructure are applied predominantly to increase the profitability of companies and improve their environmental performance along the value chain from mine products through the production of concentrates, pure chemical products, and semi-processed metals and alloys. The focus is on the operational efficiency of individual unit processes, and increasingly on the development of 'whole-of-system' solutions incorporating environmentally and socially friendly technologies that address triple bottom line ('license to operate') issues.

Context

The minerals industry is heavily globalised and very competitive. The major users of research and technology select their suppliers from the world stage and are moving from research on new technology development to the application and improvement of existing technology and issues of industry sustainability. The main justification for R&D expenditure by companies is the generation of increased productivity and lower operating costs from existing infrastructure and resources, and the minimisation of the environmental impact of their operations. The benefits of R&D expenditure must be obvious from the outset and must be implementable over short time-frames.

Within this context Minerals has achieved major growth in its share of the Australian market over the past three years, and has significantly increased its presence overseas. This has been achieved by carefully targeting its project portfolio to clients' needs, by demonstrating the value of its project outputs, and by marketing its capabilities and creative scientific approaches aggressively.

Strategies

Since much of the Division's business is with the same group of clients, establishing their trust and continued loyalty is critical for continued success. This is achieved through the demonstration of the benefits and value of the project outcomes to the client, and delivery of outcomes on scope (i.e., of the appropriate quantity and quality), on time (if not early) and on budget. Regular and open communication with the customer is an automatic feature of project operations, and feedback from the Corporate Customer Value Surveys and Post-project Reviews is actioned as a matter of high priority. Appropriate culture and management systems are being built that make the Division "easy to do business with".

Mutually beneficial, enduring and large scale relationships with customers is facilitated by a multi-level Account Management Protocol that operates from CEO to technical/project level and is based on a deep understanding of the customers' business and their current and emerging technology needs. A key component of this strategy is the development of strategic alliances with selected customers that have the potential to become, or are already major clients.

The Division is focusing on a suite of skills, experience and equipment that are able to stand close scrutiny on the world stage. Since it is not able to maintain world standing in all areas of mineral processing and metal production R&D, it is developing effective partnerships with organisations in Australia and overseas that can provide the required complementary expertise.

Much of the anticipated growth over the next five years will come from new and enhanced activities in the following areas:

- The Light Metals Flagship Project, incorporating the proposed Titanium CRC.
- Sustainable mineral processing as the cornerstone of our service to clients, incorporating the proposed Sustainable Mineral Resource Processing CRC, and expansion of the Biomineral Processing Initiative.
- Increased focus on process/plant optimisation/efficiency in customers' operations.
- Increased capability in flow-sheet modelling and process automation.

CSIRO Minerals

- Value-adding to Murray Darling Basin salt minerals included within the Healthy Country Flagship Program.
- Increased recovery of IP investment by deliberately investing to generate exploitable IP and by using innovative commercialisation arrangements, especially in on-line analysis/control and QEM*SEM.
- Increased business offshore, especially in South Africa, North/South America and Iran.

Planned Achievements (by Sector)

Mineral Resources

- More environmentally robust mineral processing operations and more effective involvement of stakeholders in strategic decision making.
- Improved understanding and application of the concept of sustainability as it relates to the minerals industry, including development of Life Cycle Analysis tools.
- Improved mineral and metal recoveries, through more selective recovery, more intense processing and 'whole-of-system' analysis.
- Optimised unit operation configurations for mineral processing through improved reactor designs obtained from mathematical models for flow-sheet design, predicting slag properties, thickener performance, materials flow, heat transfer, and reactions in multi-phase reactors.
- Improved on-line monitoring and control of processes and commercialisation of those new technologies.
- Techniques to integrate on-line 'hard' and 'soft' sensing and analysis technologies with expert/intelligent systems.
- The ability to treat ores that were previously unprofitable through the development of new processing technologies and novel applications of existing technologies.
- Novel technologies for the commercial production of value-added products from the salts in saline waters.
- Improved understanding of the relationship between ore characteristics and metallurgical performance for more reliable assessment of the efficiency of downstream processing;
- Enhanced metal extraction and waste remediation using natural organisms.
- Better consistency, quality and suitability of raw and processed materials to meet customer specifications.
- New and enhanced products and processing routes for Australian mineral/metal commodities.
- Assistance to industry in the establishment of a magnesium metal smelting and die-casting industry in Australia.
- Progress towards the development of the next generation of greenhouse-efficient aluminium and magnesium smelting technologies.
- Progress towards the establishment of a titanium metal production and fabrication industry in Australia.
- Enhanced knowledge management systems, including links with industry through targeted Extranets.

Energy and Transport

- "Greener" combustion and gasification of lignite through the development and application of computational fluid dynamics (CRC for Clean Power from Lignite).

Resources, Revenue and Expenditure Profiles

Resources Summary 2002-03

Total Revenue	\$m	39.175
- Research & Services (R&S)	\$m	15.890
- Other External	\$m	0.095
- Direct Appropriation	\$m	21.078
- CSIRO-wide Services	\$m	2.112
R&S Earnings Ratio (R&S/Total Revenue)	%	40.6
Operating Result	\$m	0.460
End of Year Cash Balance	\$m	2.307
Research Staff (full time equivalent)	no.	177
Total Staff (full time equivalent)	no.	262

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	6.410
Research Services, Consulting and Testing	\$m	9.160
Intellectual Property	\$m	0.300
Sub-Total (Invoiced Revenue)	\$m	15.870
Work-in-progress / Deferred Revenue	\$m	0.020
Total	\$m	15.890

Customer Profile *

Australian Private Sector	\$m	9.965
Research and Development Corporations	\$m	0
Australian Governments	\$m	0.311
Cooperative Research Centres	\$m	3.270
Overseas	\$m	2.024
Total	\$m	15.570

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Mineral Resources	%	94.5
Energy & Transport	%	5.5
Total	%	100

Focus

CSIRO Molecular Science contributes to the development of high technology manufacturing industries for Australia. The Division develops products and processes for domestic and global industry through the application of chemical and biological sciences. Our diverse range of core capabilities includes: Chemical Bioprocessing, Polymer Synthesis and Characterisation, Gene Technologies, Cell Biology and Bioactive Discovery. These are supported by analytical and computational technologies. The Division works with a broad range of local and multinational business and research collaborators to develop and exploit innovative materials, products, processes, and services.

Context

The community increasingly expects that scientific research will be undertaken only if due consideration is paid to social and environmental aspects of the conduct and outcomes of the research. This presents opportunities for the Division using our skills in the emerging areas of nanotechnology, biotechnology and smart polymeric materials. Recently there has been significant merger and acquisition activity consolidating drug discovery and healthcare firms into much larger enterprises with more tightly managed pipeline portfolios. This has been accompanied by the out-sourcing of research and development activities that presents us with significant opportunities.

Australian industry traditionally invests very little in research and development. In this environment the Division is required to increase its external income levels by 47% during 2002/03 to sustain the current expenditure levels. In addition, our plans must include potential salary increases during the period of the next Enterprise Agreement and allow for the redeployment of 10% of the Division's Appropriation funding from 2003/04 financial year.

Strategies

Over the 2002/03 financial year the Division will continue to consolidate its new research project structure of twenty-one clusters coupled with quarterly project reviews to ensure a robust and relevant research portfolio. We will continue to bolster a core capability in chemical biotechnology and grow the area based on bioactive chemicals using our skills in organic synthesis and separation. Our strategic alliance with DuPont on polymer synthesis and characterisation has recently been reviewed and will continue. In the area of tissue engineering and cell biology we will accelerate the development of articular cartilage and biological glue technologies. We will continue to grow our efforts in cancer and other disease detection technologies. We have undertaken a review of the level of our participation in various CRCs. The majority of our CRC commitments are to CRCs on their second round of funding, which is ramping down and this situation will be managed appropriately.

The Division has initiated a program to strengthen our core science skills that will result in the employment of 12 new PostDoctoral Fellows (9 funded by the Division and 3 jointly funded by the CSIRO PostDoctoral Scheme) and 8 new PhD candidates.

The Division is actively involved with the development of the diagnostic component of the Preventative Health Flagship Program. Employing our existing capabilities in gene technologies, our program will address the development of new approaches to early stage diagnosis of existing colonic carcinoma, and determining genetic predisposition to the condition. Participation in the Healthy Country and Energy Transformed programs is being considered.

The occupation of a new joint facility with Food Science Australia on the North Ryde site from September 2002 will permit the sharing of support functions and therefore reduce infrastructure costs.

The Division plans to market its capabilities through increased exposure in the printed media, through the production of further CD-ROMs and through a program of targeted visits to mid-sized chemical and pharmaceutical companies in the US and Europe.

Planned Achievements (by Sector)***Manufacturing***

- Synthesis of 96 templates for Pfizer for their central nervous system drug discovery program.
- Construction of insect cell lines expressing cloned pest ecdysone receptors to act as screens for the identification of novel safer insecticides.
- Discovery of a set of parasiticidal compounds for advanced evaluation in sheep as potential new animal health drug development candidates.
- Isolation of micro-organisms with potential to produce new chemical products and fuel ethanol from lignocellulose.
- Development of a nanocomposite material with superior aerospace attributes.
- Development of two new overt security features for Securrency Ltd and improve an existing machine readable security feature for currency with NPA.
- Development of a high-brightness, blue, light-emitting polymer with ITRI.

Health

- Completion of preclinical studies in Ovine Adenovirus mediated cancer gene therapy in participation with Mayne Pharma.
- Commercialisation of Ovine Adenovirus technology for other applications in gene therapy.
- Completion of the pre-clinical evaluation of the prostate cancer detection assay with Epigenomics AG.
- Identification of new opportunities to commercially exploit our gene methylation technology.
- Identification of new commercial opportunities and partnerships in biomaterials focussing on the tissue engineering of cartilage and ligaments.
- Contribution to the Preventative Health Flagship Program through the provision of R&D expertise in cancer diagnostics focussed on colonic cancer in the first instance.
- Establishment of technology for proliferation and control of phenotype of chondrocytes for repair of human articular cartilage through a tissue engineering and biotechnology program with ITRI.
- Development of a novel polymer having appropriate physico-chemical and biomaterial properties for use as a new artificial lens capable of normal accommodation (focusing).
- Achievement of biocompatibility and transparency of the polymer under development for the corneal onlay.

Mineral Resources

- Characterisation and development of a genetic system for hyperthermophilic mineral leaching Archaea.

Resources, Revenue and Expenditure Profiles

Resources Summary 2002-03

Total Revenue	\$m	39.798
- Research & Services (R&S)	\$m	17.796
- Other External	\$m	(0.027)
- Direct Appropriation	\$m	19.883
- CSIRO-wide Services	\$m	2.146
R&S Earnings Ratio (R&S/Total Revenue)	%	44.7
Operating Result	\$m	1.701
End of Year Cash Balance	\$m	1.310
Research Staff (full time equivalent)	no.	168
Total Staff (full time equivalent)	no.	215

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	12.698
Research Services, Consulting and Testing	\$m	3.946
Intellectual Property	\$m	1.339
Sub-Total (Invoiced Revenue)	\$m	17.983
Work-in-progress / Deferred Revenue	\$m	(0.187)
Total	\$m	17.796

Customer Profile *

Australian Private Sector	\$m	13.097
Research and Development Corporations	\$m	0.234
Australian Governments	\$m	0
Cooperative Research Centres	\$m	1.775
Overseas	\$m	1.539
Total	\$m	16.644

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Manufacturing	%	54.6
Health	%	43.0
Energy & Transport	%	1.3
Mineral Resources	%	1.0
Total	%	100

Focus

CSIRO Petroleum Resources provides research capabilities and technology directed at maintaining an internationally competitive and sustainable Australian energy industry with a primary focus on oil and gas and some work on geothermal energy. It concentrates on exploration, field appraisal, production and gas processing. Multidisciplinary skills in geology, geophysics, mathematical modelling, geomechanics and petroleum / production / chemical engineering are applied to four underlying themes: improving exploration and appraisal performance, reducing costs with innovative technology, minimising the industry impact on the environment, and maximising the value to Australia from its oil and gas resources. The results of our research are applied in the Energy and Transport Sector.

Context

Australia's oil outlook is poor. Over the past 7 years, new oil discoveries in Australia represent less than one third of consumption over the same period. By 2009-10 it is estimated that approximately 60% of oil and petroleum products consumed in Australia will be sourced from imports, representing more than 200 million barrels per year (ABARE, Geoscience Australia). Such a scenario has profound implications for the balance of payments, government revenues, energy security and the broader economy.

On the other hand, Australia is relatively gas - rich with significant reserves in the NW quadrant. Adding value to Australia's gas reserves through the development of new gas processing technologies represents a major opportunity of national significance.

The environmental consequences of oil and gas development and utilisation are of growing national and international concern. Protection of the marine environment in areas of offshore exploration and production and achieving significant reductions in greenhouse gas emissions are significant issues for Australia and the oil and gas industry.

Strategies

CSIRO has established itself as the major Australian R&D provider addressing Australian priorities, but operating on a global stage. The Division maintains strategic relationships with the Australian Petroleum CRC, with other national and international research agencies, and with service and operating companies. In response to national priorities, five broad research strategies are being pursued aimed at:

- Encouraging greater exploration activity through the development of innovative exploration technologies that are environmentally sustainable and reduce exploration risk.
- Improving oil and gas (in coal) recoveries through improved reservoir management and reduced production costs.
- Developing a capability in gas processing technology that will underpin the development of an Australian gas-to-liquids industry.
- Demonstrating the practicality of geological storage of CO₂ in deep aquifers and unmineable coal and.
- Assessing geothermal energy from hot dry rocks for electricity generation.

In the context of the SAP and in support of the broad strategic objectives, a number of Divisional initiatives will be pursued including:

- Strengthening our links with the key industry players in Australia, especially Woodside and Shell.
- Developing the Division as an R&D business with a greater emphasis on generating external income from spinoff activities, equity positions and royalties and licencing agreements.
- Strengthening links with national oil companies, especially in Asia, in order to generate greater international exposure and uptake of CSIRO-developed technologies.

CSIRO Petroleum Resources

- Participation in the Energy Flagship Program.
- Increasing the numbers of PhD students and Post-doctoral fellows.
- Developing collaborative research in the emerging science areas of complexity, nanotechnology and social -economic interaction.
- Building the research capacity in gas processing, both equipment and people.
- Participating as the major player in the development of the CO2CRC proposal.

Planned Achievements (by Sector)

Energy and Transport

- Quantification of petroleum generation processes, including source potential and thermal histories of source rocks as a basis for more effective exploration for oil.
- Improved prediction of petroleum migration and accumulation histories and improved reservoir estimation through a better understanding of the evolution of reservoir fluids over geological time.
- Technology to improve the appraisal of fault conductivity and its impact on seal integrity and reservoir compartmentalisation.
- Develop capabilities in chemostratigraphy and geochemical modelling for high resolution correlation and the prediction of regional diagenetic patterns
- Continue to improve and apply capabilities in numerical forward stratigraphic modelling and demonstrate its use in an integrated hydrocarbon exploration and development environment.
- New technologies to increase the quality of appraisal and the efficiency of field development emphasising high resolution definition of reservoir properties and production parameters.
- Quantify the processes involved in using hydraulic fracturing to pre-condition ore and induce caving in mining. Improve prediction of hydraulic fracture growth in naturally fractured rock.
- Technology for pore pressure prediction in advance of drilling.
- Develop a geophysical capability integrating theoretical rock physics with numerical and analog modelling focused on a quantitative seismic description of reservoir dynamics.
- Development of new drilling and completions technologies and knowledge management systems for increased operational performance and cost reduction.
- Enhance and convert wellbore stability and drilling fluid optimisation technology into products useful to the wider petroleum industry.
- Develop drilling fluid and waste management technology to meet advanced drilling requirements and marine environmental regulations.
- Develop and apply software incorporating state of the art concepts in risk assessment and decision making under conditions of uncertainty.
- Develop experimental testing of conversion of natural gas to liquids, focused initially on the cost efficient production of synthesis gas and clean diesel.
- Apply numerical simulations of coupled flow and geochemistry to potential Australian sites for geological sequestration of CO₂.
- Develop reservoir models to promote economic gas flows and improved resource recovery from low permeability coals and sandstones in eastern Australia.
- Conduct feasibility studies on the technology requirements for extracting geothermal energy from deeply buried heat sources in the Cooper Basin.

Resources, Revenue and Expenditure Profiles

Resources Summary 2002-03

Total Revenue	\$m	19.522
- Research & Services (R&S)	\$m	8.108
- Other External	\$m	0
- Direct Appropriation	\$m	10.361
- CSIRO-wide Services	\$m	1.053
R&S Earnings Ratio (R&S/Total Revenue)	%	41.5
Operating Result	\$m	0.249
End of Year Cash Balance	\$m	0.043
Research Staff (full time equivalent)	no.	72
Total Staff (full time equivalent)	no.	106

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	3.500
Research Services, Consulting and Testing	\$m	4.300
Intellectual Property	\$m	0.200
Sub-Total (Invoiced Revenue)	\$m	8.000
Work-in-progress / Deferred Revenue	\$m	0.108
Total	\$m	8.108

Customer Profile *

Australian Private Sector	\$m	3.200
Research and Development Corporations	\$m	0
Australian Governments	\$m	0.500
Cooperative Research Centres	\$m	0.600
Overseas	\$m	3.500
Total	\$m	7.800

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Energy & Transport	%	96.9
Mineral Resources	%	3.1
Total	%	100

Focus

CSIRO Plant Industry carries out research in the plant sciences to make Australia's agri-food, fibre and horticultural industries more profitable and sustainable. A major focus is on improving production efficiency and reliability while maintaining the natural resource base. We are placing increasing emphasis on product quality related objectives for the processing and manufacturing sectors and the development of novel plant products. Our research also contributes to conservation of biodiversity in the Australian flora and the implications of global climate change for natural and agricultural ecosystems.

Context

A major task facing CSIRO Divisions over the next year will be development of Strategic Plans in advance of negotiations with Government for funding over the next Triennium.

We are optimistic that over the next five years Plant Industry will be able to maintain research effort at current levels, with balance of effort shifting in response to development of new areas of science and emerging national and industry priorities.

2002-2003 will see the first seed funding for CSIRO Emerging Science and Flagship Projects. We will continue to develop our expertise in genomics, proteomics, metanomics, biochemistry and developmental biology in partnership with other institutions, and our involvement and investment in the Agrifood Top5 and Healthy Country Flagship Projects. At the same time, we will move to strengthen our delivery of science through smart plant breeding and farm management technologies, and technology transfer vehicles.

The year will also see some major new partnership initiatives come to fruition, such as the New South Wales Agricultural Genomics Centre and development of the Major National Research Facility with the Wine Research Institute in Adelaide.

Our involvement with CRCs will be expanded through establishment of the Plant Based Solutions to Salinity CRC in 2002; and as the lead CSIRO Division in supplementary bids for the Cotton and Viticulture CRCs, and a new bid for a Sugar CRC. We will also be involved in a bid for an extension of the Rice CRC.

Strategies

Through our strategic planning process we will be developing a more meaningful interface of our research with industry, government and the community. This will involve some restructuring of our Programs and Projects, and presentation by themes consistent with current Federal Government intentions to move to thematic priority areas. This presentation will be through a number of avenues including CSIRO On-line.

Other communication initiatives will include an e-newsletter of research news targeting government, industry, extension officers/users of research results, and to be placed on the Internet for access to a broader public audience. Our gene technology information package will be updated to a standard that is responsive to the needs of stakeholders including the community.

Our aim is to position CSIRO with the best possible prospects for attracting a greater degree of support from governments and from industry, and to continue the drive for fewer, larger, longer term grants and strategic alliances to provide greater flexibility in deployment of resources to meet partnership objectives.

Throughout we will maintain our role in public interest research, and an appropriate balance of strategic and applied research for industry long-term sustainability objectives.

These strategies are underpinned by our commitment to world-class excellence in science, urgency, and relevance, together with industry involvement in the delivery of that science.

In operating excellence we will be conducting ongoing reviews of our research support services, with particular attention this year to strengthening the OH&S culture and infrastructure across the Division. The new structure will include a Divisional OHS&E Manager supported by trained Safety Officers at all Divisional locations around Australia. At the same time, new arrangements for Comcare rehabilitation and case

management will be implemented across the Division to ensure that all staff have access to an efficient, effective and supporting service.

From 1 July 2002, we will have set up project management and accountability systems according to ANAO and Einhorn recommendations.

Planned Achievements (by Sector)

Agribusiness

- Determine whether genes encoding ABA biosynthetic enzymes are up regulated in dormant barley grains.
- Determine the design rules for silencing a single member of a multi-gene family.
- Test grain from Sr31(Stem rust resistance gene 31) for quality characteristics, including the sticky dough character, in order to determine whether this germplasm can be used in Australian wheat breeding programs.
- Complete the development of a lucerne removal package for subsequent release to the GRDC and distribution to lucerne growers, advisors and collaborating researchers.
- Clone and characterise a gene for tolerance to manganese (a problem in acid soils) and evaluate its potential for use in crop improvement
- Identify genes that are induced by water deficit in field-simulation conditions in wheat and develop gene expression fingerprints for water stress and tolerance to water stress.
- Commence a major new project on constraints to yield and sustainability in the northern sandplain region of Western Australia, an area that produces 15% of the Australian wheat crop and most of the lupin crop.
- Define biophysical constraints to crop production in higher rainfall regions of Western Australia, to identify target yields for the farming community and the conditions under which they can be achieved.
- Characterise the source of variation in kernel composition of macadamia nuts, a key determinant of quality traits of importance to consumers and markets.
- Identify table grape selections with high potential from national trials of 15 best selections.
- Identify environmental, physiological and management factors between flowering and harvest that are associated with high yield in mango.
- Develop genetic markers for the identification of a major resistance gene for the control of powdery mildew in grapevines.
- Evaluate advanced breeding lines of Barleyplus containing high amylose starches and high beta-glucan content and define resistant starch content, impact on glycaemic index, cholesterol reducing ability and other health benefits in human feeding trials.
- Develop novel wheats based on combinations of high molecular weight glutenin genes demonstrated to have important positive impacts of wheat flour quality.
- Release CottonLOGIC for Palm OS® handheld devices for decision making in the field.
- Test transgenic white clover plants containing the LAR (leucocyanidin reductase) transgene for catechin and tannin synthesis in leaves, to reduce incidence of bloating.

Natural Resource Management and Environment

- Complete, publish and release CD of Australian Tropical Rain Forest Plants – Trees, Shrubs & Vines.
- Assess genetic variation and structure (10 loci) in 20 populations each of *Acacia robusta* and *Swainsona* sp. in relation to remnant patch size, isolation, condition and vegetation association.

CSIRO Plant Industry

- Ready the CSIRO cotton breeding program with a number of varieties to contain the Monsanto Bollgard II traits.

Resources, Revenue and Expenditure Profiles

Resources Summary 2002-03

Total Revenue	\$m	81.054
- Research & Services (R&S)	\$m	37.500
- Other External	\$m	0.870
- Direct Appropriation	\$m	38.313
- CSIRO-wide Services	\$m	4.371
R&S Earnings Ratio (R&S/Total Revenue)	%	46.3
Operating Result	\$m	(0.511)
End of Year Cash Balance	\$m	10.395
Research Staff (full time equivalent)	no.	520
Total Staff (full time equivalent)	no.	652

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	33.333
Research Services, Consulting and Testing	\$m	0
Intellectual Property	\$m	5.380
Sub-Total (Invoiced Revenue)	\$m	38.713
Work-in-progress / Deferred Revenue	\$m	(1.213)
Total	\$m	37.500

Customer Profile *

Australian Private Sector	\$m	9.000
Research and Development Corporations	\$m	16.827
Australian Governments	\$m	4.401
Cooperative Research Centres	\$m	1.000
Overseas	\$m	2.105
Total	\$m	33.333

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Agribusiness	%	87.1
Natural Resources Management & Environment	%	9.1
Manufacturing	%	3.8
Total	%	100

Focus

Underpinning the national goal of achieving ecological, social and economic sustainability in the management of Australian landscapes is the common thread that binds together the various research programs conducted within Sustainable Ecosystems. The scope of our research ranges from conservation to agricultural production, from ecological monitoring to farm system modelling, from managing pest animals to minimising grazing impact in rangelands. Researchers in the Division, which has eight laboratories around Australia, strive to gain knowledge of the nation's diverse ecosystems and to apply this knowledge in developing methods and strategies to ensure sustainability of these ecosystems and the regional communities that depend on them.

Context

The main focus for Sustainable Ecosystems (CSE) is to move from the environment of a scientific research institute to a scientific research business environment. We are developing a number of strategies to ensure that this transition takes place in an efficient, effective and timely fashion. There will be increasing pressure from stakeholders and clients to develop whole system solutions that are sustainable and benefit the end user. The demand from government and industry for profitable technological products and solutions will also increase.

It is anticipated that factors such as ongoing degradation of landscapes, the loss of native flora and fauna and inadequate natural resource management practices will increase the demand for environmental services in the future. These trends will have an impact on the following research areas:

- Biotechnology solutions for pest control and remediation
- Landscape design and rehabilitation
- Natural resource management
- Regional and urban design
- Agricultural production systems (modelling)

National priorities set for Australian Research Council (ARC) funding include biotechnology and complex systems, both of which are areas in which CSE has considerable expertise and capacity. Australia and New Zealand Environmental and Conservation Council (ANZECC) priorities for biodiversity conservation also provide opportunities in an area where CSE has considerable capacity.

The National Heritage Trust Program (NHT2) and the National Action Plan for Salinity and Water Quality (NAP), with their focus on integrated regional natural resource management planning, provide opportunities for CSE to harness interdisciplinary and integrative skills for Australia's benefit.

Strategies

CSE was created through the merging of the former CSIRO Division of Wildlife and Ecology and the farming systems and natural resource management teams from the former Division of Tropical Agriculture. This provided a unique opportunity to restructure the 10 research programs of those Divisions in order to promote business development and enhance research impact. This strategic planning process resulted in the following 5 new research programs and a business services program:

- Tropical Landscapes
- Agricultural Landscapes
- Rangelands and Savannas
- Wildlife, Pests and Diseases
- Resource Futures

- Business Services.

These programs provide the disciplinary base for delivery to the Division's research themes:

- resilient rural and regional communities
- Prosperous rural enterprises
- Maintaining biodiversity and ecosystem function
- National options for long-term sustainability
- Biotechnology solutions for ecosystem management
- Healthy urban ecosystems
- Promoting innovative partnerships in CSE.

After reviewing its investment portfolio, the Division's Executive Committee has agreed to place priority on growing its investment in healthy urban ecosystems, resilient rural and regional communities, and national options for long-term sustainability.

CSE will continue to improve relationships with its key stakeholders and form partnerships with Research and Development Corporations (RDCs) and Commonwealth agencies for external funding. CSE will also target the international market, and in particular explore opportunities in the Asian market.

Participation in CSIRO's new initiatives will be core activities for the Division. Investment in the Healthy Country Flagship Program, the eAustralia Flagship Program and the Socio-Economic Integration, Complex Systems and Biotechnology Science Focus Investment Groups will take particular priority.

The Division will continue participating in the Rainforest, Tropical Savannas, Pest Animal Control and Sustainable Sugar Production CRCs. CSE is driving a bid for a new Desert Knowledge CRC and is also involved with supplementary bids on biodiversity components of the CRC for Plant Based Management of Dryland Salinity and the Australian Cotton CRC.

Our research and development needs to be intimately connected with government and policy makers and with local and regional communities — that is with the people who will implement changes in land management. This is the opportunity and the challenge for our new Division — to form the partnerships that will ensure we ask the right questions and deliver useful outcomes to the people who make the decisions. Application of the knowledge and scientific expertise within the Division will help provide favourable options and facilitate these beneficial outcomes.

Planned Achievements

Many of the achievements listed below are shared across sectors (especially Natural Resource Management and Environment, and Agribusiness), because of the multi-disciplinary nature of CSE's work. By drawing on our expertise in conservation biology, biodiversity and farming systems, and in partnerships within and external to CSIRO, we will tackle challenges facing both natural and modified ecosystems in Australia. In particular, we will:

- Improve the management of vertebrate pests and conservation of native fauna through better knowledge of biological and ecological processes — including use of biotechnological solutions.
- Change the thinking and behaviour of Australians in regard to the services and values society receives from, and places on, natural ecosystems and have this reflected in natural resource policy and management.
- Provide communities and natural resource and regional development managers, in a number of regions, with information and decision-making tools which allow trade-offs between ecological, economic, social and institutional considerations — so helping regions plan their future.

- Develop principles, management guidelines, computer models and scenarios which contribute to a balance between production and conservation across Australia and assist in targeting public investment in natural resource management.
- Use participative approaches — interact with communities and other stakeholders — to link research analysis with productive land uses and with natural resource management and policy.
- Formulate and test new designs for Australia's physical economy and the sectors therein, so leading to more sustainable levels of population size, lifestyle, consumption, urban function, industrial development, energy and material flows, physical trade and environmental impact.
- Develop strategies — based on a predictive understanding of community and landscape dynamics — for sustainable utilisation, conservation and management of Australia's unique tropical rainforests, savannas and rangelands.
- Develop and apply protocols for assessing and monitoring the health of Australian ecosystems.
- Build capacity in urban ecology by bringing together concepts of environmental health and community well being in a complex systems framework.
- Promote new research opportunities, improved business activities and better delivery of outcomes through exploration of innovative synergies between business service and research staff.
- Develop an innovation system in CSE to create a climate in which people can flourish and where the workforce is encouraged to be committed, self-managing life-long learners.

Resources, Revenue and Expenditure Profiles

Resources Summary 2002-03

Total Revenue	\$m	39.745
- Research & Services (R&S)	\$m	12.473
- Other External	\$m	0.458
- Direct Appropriation	\$m	24.671
- CSIRO-wide Services	\$m	2.143
R&S Earnings Ratio (R&S/Total Revenue)	%	31.4
Operating Result	\$m	(0.950)
End of Year Cash Balance	\$m	8.148
Research Staff (full time equivalent)	no.	197
Total Staff (full time equivalent)	no.	281

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	9.921
Research Services, Consulting and Testing	\$m	1.750
Intellectual Property	\$m	0.102
Sub-Total (Invoiced Revenue)	\$m	11.773
Work-in-progress / Deferred Revenue	\$m	0.700
Total	\$m	12.473

Customer Profile *

Australian Private Sector	\$m	2.268
Research and Development Corporations	\$m	1.608
Australian Governments	\$m	5.217
Cooperative Research Centres	\$m	2.350
Overseas	\$m	0.227
Total	\$m	11.671

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Natural Resources Management & Environment	%	62.0
Agribusiness	%	32.8
Manufacturing	%	4.4
Mineral Resources	%	0.6
Information, Communication & Services	%	0.2
Total	%	100

Focus

CSIRO Telecommunications and Industrial Physics (CTIP) provides innovative commercial solutions for industry in the information technology and telecommunications, security, health, manufacturing, mining and energy areas and provides national standards of measurement and traceability supporting product development, testing and trade. CTIP is responsible for the National Measurement Laboratory (NML) - a National Facility - and NASA's Deep Space Operations at Tidbinbilla.

Context

- A review of Information and Communications Technology (ICT) is underway in CSIRO.
- General downturn in the ICT industry sector throughout the world.
- The need to compete in a global business environment.
- The need for CSIRO to be seen as a sound investment with substantial returns rather than an organization which requires appropriation funding to cover its expenditure ie a move from an input focused view to an outcomes based evaluation.
- A proposal to incorporate the National Measurement Laboratory into a new National Measurement Institute (NMI) has wide support from within and outside CSIRO. The Division will pursue the establishment of a new NMI with a view to securing the future of NML.
- Planning for the majority of CTIP staff to be housed on a single site.
- The events of September 11th have led to increased interest in CTIP's security technologies (face recognition, biosensors, sub-surface radar) and substantial government investment in security. New opportunities in these and related areas will be investigated in 2002-03.
- Government and the public are increasingly concerned about the cost of health and aged care. This creates new opportunities to advance the division's activities in telehealth, home care and e-Health.

Strategies

- Make a major contribution to the Preventative Health and e-Australia Flagship programs.
- Make significant contributions to Nanotechnology and ICT (Telepresence and Smart Spaces) new science areas.
- Increase postdoctoral, post graduate and visiting scientist presence.
- Allocate appropriation funds via an in-house investment approach.
- Focus on fewer technology areas with larger projects.
- Increase customer focus, key alliances and repeat business.
- Co-invest with state, national and international government departments and selected university departments.
- Develop an in-house incubator in which we will prepare companies for spin-off.
- Offer total systems solutions for customers involving improved industrial engineering skills and development of ISO9000 manufacturing capabilities.
- Audit IP and put in place a mechanism to systematically capture new IP as it is generated.
- Substantially increase business development and commercialisation resources while continuing to develop the commercial awareness of research staff.
- A strategy centred on 'ICT providing solutions to the "Tyranny of Distance"' has commenced aimed at reducing the cost of bandwidth in Australia and in the global market. Research on telecommunications systems, infrastructure, protocols and services will provide the user with

CSIRO Telecommunications and Industrial Physics

seamless, "always connected" access to broadband services regardless of location or class of user equipment.

- Identify the skills needed in the next 3 to 5 years. Use the results of the skills stocktake for future recruiting.

Planned Achievements (by Sector)

Information, Communication and Services

- Develop technologies and concept demonstrators for gigabit wireless systems.
- Continue development of a proof-of-concept millimeter-wave imaging system.
- Develop dual-band antenna systems for commercial and defence satellite communications.
- Continue commercial exploitation of the CSIRO MultiBeam antenna technology by developing distribution arrangements.
- Support the operation of the FedSat Ka-band transponder for communications and propagation experiments.
- Commercially exploit and investigate new application areas for CSIRO's high precision wireless-based position location technology.
- In collaboration with CSIRO ITS branch, the Centre for Networking Technologies in the Internet Economy (CeNTIE) will deploy an advanced research network linking the major CSIRO sites and two Universities in Sydney and the sites of members of the Interactive Virtual Environments Centre in Perth by March 2003.
- In collaboration with Nortel Networks Australia, CeNTIE will develop and demonstrate networking technology for creating virtual enterprises, on-demand, on the research network by June 2003.
- Develop high-speed Internet access and related applications for guaranteed quality of service.
- Provide antenna and signal processing solutions for the proposed square-kilometre array radio telescope.
- Contribute to international radio propagation standards through our participation in the International Telecommunications Union.
- Commercialise SQIS™ face recognition technology.
- Identify partners for the exploitation of the division's expertise in biosensors.

Manufacturing

- Demonstrate value proposition for the OPTI printing control system and commence incubation of a business based on the technology.
- Demonstrate value of the baNDIcoot non-destructive testing system and establish a path for its commercialization.
- Demonstrate a SQUID-based system for detecting contaminants in food products and establish a path for its commercialization.
- Secure a major contract with California Institute of Technology for the supply of optical components for the LIGO II gravity wave observatory.
- Develop a new range of products based on nanoparticle structures.

Measurement Standards

- Construct a robust, continuously operating, microwave frequency standard based on laser cooled trapped ytterbium ions.

- Maintain third-party accreditation for calibration services through formal re-assessment using international peer assessors.
- Commence a project to establish an ac voltage standard using a superconducting Josephson array (in collaboration with NMIJ, Japan).
- Gain international recognition for Australia's natural gas composition standards through participation in a comparison of national standards.
- Prepare gravimetric standards for greenhouse gases in air.
- Undertake a study of probe/surface interactions in the nano-scale region.
- Re-establish the Australian radiation scale using the cryogenic radiometer.

Health

- Initial commercialisation of Hospital Without Walls technology.
- License aortic aneurysm surgery planning software.
- Commence new research projects on telepresence, smart spaces and medical imaging.
- In collaboration with CMIS, commence development of a haptic virtual reality surgical simulator to be used by Australian surgeons for skills training.

Resources, Revenue and Expenditure Profiles

Resources Summary 2002-03

Total Revenue	\$m	64.283
- Research & Services (R&S)	\$m	21.800
- Other External	\$m	0
- Direct Appropriation	\$m	39.017
- CSIRO-wide Services	\$m	3.466
R&S Earnings Ratio (R&S/Total Revenue)	%	33.9
Operating Result	\$m	(0.852)
End of Year Cash Balance	\$m	7.265
Research Staff (full time equivalent)	no.	281
Total Staff (full time equivalent)	no.	394

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	3.145
Research Services, Consulting and Testing	\$m	15.855
Intellectual Property	\$m	2.800
Sub-Total (Invoiced Revenue)	\$m	21.800
Work-in-progress / Deferred Revenue	\$m	0
Total	\$m	21.800

Customer Profile *

Australian Private Sector	\$m	6.792
Research and Development Corporations	\$m	0
Australian Governments	\$m	3.157
Cooperative Research Centres	\$m	1.669
Overseas	\$m	7.382
Total	\$m	19.000

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Information, Communication and Services	%	38.6
Manufacturing	%	25.5
Measurement Standards	%	22.6
Health	%	5.0
Mineral Resources	%	4.7
Natural Resources Management & Environment	%	3.7
Total	%	100

Focus

CSIRO Textile and Fibre Technology (CTFT) provides social and economic benefits to Australia through technological innovation that supports Australia's fibre producing and processing industries. Research areas include the specification of raw wool, technical textile products, and the production of hides, skins and leather. Emphasis is on the development of innovative textile and clothing products, integrating all elements of the processing pipeline and sustainable production at all levels. The Division has a wide range of multidisciplinary skills capable of servicing wool, cotton, technical textiles and leather at national and international levels. We are recognised as the world's leading wool research laboratory supporting Australia's third largest rural commodity export earner. CTFT is the home of the Centres of Excellence in Technical Textiles and Advanced Wool Products.

Context

Wool prices continue to recover strongly with demand fuelled by reduced production and a competitive Australian dollar. Fine wool continues to perform strongly together with big advances in mid-micron wool prices. Wool exports are predicted to top \$4B next year. Cotton prices continue to remain low. Crop yields have been excellent despite early season inclement climatic conditions. Despite these concerns producers remain optimistic and have recently voted to increase the levy.

The sheepskin and leather segments are seeking to focus on areas of competitive advantage for Australian leather products, medical sheepskins, crocodile skins and kangaroo leathers. Tannery environmental issues including salinity are to be targeted.

Technical textiles continue to grow strongly. Characteristics of this industry segment are: (i) it views itself as part of the advanced materials sector, (ii) many companies are innovative subsidiaries of large multinational firms and (iii) it supplies niche market but high volume products with specific functional characteristics to a multitude of industrial and consumer markets.

Many companies have now accessed the Strategic Investment Program for capital expenditure (40% rebate possible) and are utilising the scheme for R&D (90% rebate possible).

International opportunities lie with the very large textile machinery manufacturers who service the global marketplace and who depend heavily on patentable innovations. They are willing to licence patent-protected technologies developed to prototype stage. Worldwide activity continues to grow in the area of smart textiles that can sense internal and external environmental changes and react to this to benefit the wearer. Potential applications are in health, defence, sport and everyday consumer activities.

Strategies

Four key areas for growth have been identified where CTFT can add significant benefit to Australia's wool, cotton and other natural fibre industries, as well as the high growth, innovative segments of the Australian Textile, Clothing, Footwear and Leather (TCFL) industries. The identified growth areas focus on : wool, cotton, advanced textile developments and consultancy.

Benefits to Australia will include: more sustainable wool and cotton industries through increased demand brought about by new products and reduced processing and marketing costs, a possible new textile development spin-off company, a more vibrant technical textiles industry, international networks in smart textile science and technology, and more graduates with capabilities in textile science and engineering.

New areas of science to support this growth strategy have been identified in nanotechnology with the application to fibres and textiles of nano-tubes, conducting polymers and flexible sensors. There are real opportunities to develop platform technologies that will benefit all fibres, in particular Australian wool and cotton.

In order to support our thrust into technical textiles and to maximise the impact of new technologies to the processing of Australia's natural fibres, it is strategically important that the emergent area of nano-technology and its application to fibre production and processing be studied. A major part of the Division's appropriation money will be invested in nano-technology research, together with leveraging off the expertise

CSIRO Textile and Fibre Technology

across CSIRO in this particular area. In addition, CTFT will pursue its strategic alliances with global leaders in the fields of conducting polymers and electronic fabrics.

CTFT, together with one of its strategic partners, plans to incorporate new platform technologies in sensing fabrics and remote monitoring to the Preventative Health Flagship Program.

A significant investment in new, state-of-the-art technical textiles equipment will bring the newly formed Centres of Excellence in Technical Textiles and Advanced Wool Products to world best facilities. This new equipment will be complemented by additional equipment at Deakin University under a joint Victorian Science and Technology Infrastructure initiative together with Commonwealth funding provided under a separate grant.

A series of new appointments (6-8eft personnel) across a range of disciplines will be made to ensure succession plans are implemented. In response to the departure of two Divisional Management representatives, the management team will be revised with a Divisional structure focussed outwards on the key growth areas together with strong resource management focus of staff and resources in a matrix structure.

Planned Achievements (by Sector)

Manufacturing

New Technologies

- Industry trials in a wool combing plant of a new on-line measurement system will be completed.
- New technology for increasing the production rate of worsted cards will be developed and trialled in industry.
- In conjunction with our licensee, industry proving trials of a new card wire, Sirolock, will be completed both in wool and nonwoven applications.
- A feasibility study to evaluate the use of fibres in the mining industry will be completed.

Technical Textiles

- The development and industry trials of new technology, including a 2-dimensional on-line control system, for nonwoven production will be completed.
- An "intelligent knee sleeve" will be validated as a training device for AFL footballers (and other sports) to reduce the occurrence of ACL injuries.

Cotton

- Benchmarking the processing performance of Australian cotton against competitive growths in overseas mills will be completed.
- A method for the rapid measurement of cotton fibre linear density and maturity will be trialled in industry.
- Feasibility of a method for detecting white specks in cotton yarns will be established.

Wool

- Trials of a novel plasma treatment system applicable to a wool spinning plant will be completed and its economic feasibility established.
- Conditions for spinning wool and wool blends on high-speed air spinning systems will be established.
- A project investigating the feasibility of imparting an easy care, 3-D finish to wool-containing fabrics will be completed.
- The market opportunities for a novel range of wool/cotton bi-layer fabrics will be assessed through presentations to selected manufacturers and end-product users in both Australia and overseas.
- A prototype laboratory machine to modify wool fibres for improving next-to-skin comfort will be developed.

- In a joint initiative with CSIRO Molecular Science, the feasibility of photostabilising fluorescently-whitened wool will be evaluated.

Bast Fibres

- The feasibility of deriving and processing cottonised fibres from linseed stalks will be established and a market assessment completed.

Leather

- Improved systems for preservation of crocodile skins will be implemented by an industry collaborator.
- Low salt tannery processes will be developed ready for industry trialling.

Resources, Revenue and Expenditure Profiles

Resources Summary 2002-03 *

Total Revenue	\$m	24.006
- Research & Services (R&S)	\$m	9.960
- Other External	\$m	0.511
- Direct Appropriation	\$m	12.241
- CSIRO-wide Services	\$m	1.294
R&S Earnings Ratio (R&S/Total Revenue)	%	41.5
Operating Result	\$m	0.231
End of Year Cash Balance	\$m	9.058
Research Staff (full time equivalent)	no.	105
Total Staff (full time equivalent)	no.	189

* Budget estimates as at 11 September 2002. Staff numbers as at 30 June 2002.

Research and Services Revenue by Business Domain

Coinvestment (Strategic R&D)	\$m	1.250
Research Services, Consulting and Testing	\$m	8.010
Intellectual Property	\$m	0.500
Sub-Total (Invoiced Revenue)	\$m	9.760
Work-in-progress / Deferred Revenue	\$m	0.200
Total	\$m	9.960

Customer Profile *

Australian Private Sector	\$m	8.260
Research and Development Corporations	\$m	0.300
Australian Governments	\$m	0.400
Cooperative Research Centres	\$m	0.300
Overseas	\$m	0
Total	\$m	9.260

* Customer profile for the Coinvestment and Research Services, Consulting & Testing Domains (Invoiced Revenue only).

Planned Investment Profile by Sector

Manufacturing	%	100.0
Total	%	100

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