Piloting Commercial Scale Supply of Mass Selected Sydney Rock Oysters

Authors: Select Oyster Company P/L

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This project was conducted by
Select Oyster Company Pty Ltd 0402 677 534 selectoysterco@gmail.com

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Office Mark Oliphant Building, Laffer Drive, Bedford Park SA 5042
Postal Box 26, Mark Oliphant Building, Laffer Drive, Bedford Park SA 5042

Tollfree 1300 732 213 Phone 08 8201 7650 Facsimile 08 8201 7659
Website www.seafoodcrc.com ABN 51 126 074 048

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Non-Technical Summary

2013/709. Piloting Commercial Scale Supply of Mass Selected Sydney Rock Oysters

PRINCIPAL INVESTIGATOR: Jane Clout

ADDRESS: Level 6, 35 Chandos Street St. Leonards. 2065. PO Box 459 St. Leonards NSW 1590. Australia.

PROJECT OBJECTIVES:

1. Implementation of industry-managed protocols for selected lines of Sydney Rock Oyster broodstock.

2. Develop improved communication with end users with regard to availability, properties and management of available, selected stocks.

3. Coordination of hatchery requirements with broodstock availability to improve supply.

4. Development of human resources with shellfish specific experience.

5. Introduction of selected broodstock into more multiplier hatcheries.

6. Development of a platform to support delivery of outcomes of current research projects including the developing family breeding program.

ABSTRACT

This project has established a system of broodstock management for the Sydney Rock Oyster (SRO) breeding program whereby the ownership and management of broodstock of mass selected lines of SRO have been passed onto industry, and effected by Select Oyster Company P/L (SOCo). This process ensures that selected lines of broodstock are maintained in multiple estuaries, and made available to commercial hatcheries, thus providing industry access to genetically improved lines of stock and contributing to the preservation of genetically improved seed. In addition, SOCo have formed working relationships with three commercial hatcheries by providing broodstock for production runs where requested. In doing so the NSW DPI Fisheries bivalve hatchery has been relieved of pressures to channel state resources into commercial production runs, and enable focus on research and development of the family breeding program (FBP). Transition to a FBP is an acknowledged priority for the SRO industry. With a systematic approach to broodstock management, the foundations are now in place for an efficient transition into a commercial FBP. A major priority now for SOCo is to source and fund the genetic services required to guide our operational breeder, the DPI, in single-pair matings. In the market, production capacity has been less than expected. A combination of suboptimal broodstock conditions and technical issues innate to each hatchery has had negative impacts on the timely delivery of commercial quantities of spat. SOCo is addressing these problems through extension programs including training and research to identify ways to improve broodstock conditioning techniques and reduce technical constraints in hatcheries. The outlook is positive; genetic gains from the family breeding program have been identified and industry demand for selected lines exceeds supply. Furthermore, with the employment of an Operations Manager eighteen months ago, SOCo has been able to action more business operations including broodstock management, and increase collaborative opportunities and communications with industry, oyster consortium groups and our partners the DPI.

OUTCOMES ACHIEVED

Select Oyster Company P/L (SOCo) has established and put into practice an operational model which sets the foundations for the Sydney Rock Oyster (SRO) industry-owned mass selection breeding program, and ultimately a family breeding program, through a broodstock management system and commercial access to improved genetic stock.

Through appointment of an Operations Manger, SOCo channel human resources into the management of mass selected lines of SRO broodstock, and give commercial hatcheries access upon request to the best conditioned stock, for production runs. Sound working relationships with five commercial hatcheries, three which are using selected broodstock for production runs, has ensured that a system for commercial access to selected lines is in place and can be used when the program transitions to family breeding The diversity of hatchery sources reduces the risks of biosecurity stock lock-down due to diseases, or the risk of undersupply if one hatchery cannot produce.

SOCo has facilitated sales of selected lines of spat from commercial hatcheries. In 2011/2012, 16 million spat were sold, largely by NSW DPI bivalve hatchery. Our production target was 30 million by 2014 however; just less than 20 million was sold. Shortfalls in sales were due to a combination of factors including: technical issues in hatcheries, suboptimal broodstock condition at times of peak hatchery demand, various unpredictable commercial disruptions to supply of existing seed and the outsourcing of commercial seed production to privately run hatcheries to facilitate NSW DPI investment into the family breeding program. Despite sales shortfalls the demand for selected lines of stock is growing. SOCo have traced sales to at least 42 customers predominantly in NSW and a few in south QLD. We're confident that the original projection of demand for 30 million seed per year is achievable. Disease pressures and an interest in the uptake of selected lines on the basis of positive feedback on stock performance and SOCo customer service are certainly increasing the number of inquiries SOCo receive, and translating to a steady penetration of stock onto more farms. If technical constraints to consistency and volume of seed supply are addressed, it is likely that an additional 10 million spat would have been taken up by the industry this past year, increasing our customer base, and sales quotas per farm, and boosting industry confidence in a reliable supply. SOCo have identified the need for hatchery training and capacity building to secure commercial production and preservation of genetic gains. Improving technical capacity in hatcheries, and broodstock conditioning research and development are ongoing and mutually inclusive challenges.

Family breeding offers a bright future for f the SRO breeding program and SOCo have developed a sound working relationship with our operational breeder the NSW DPI PSFI.

LIST OF OUTPUTS PRODUCED

Staff: an Operations Manager (0.75 FTE) employed in October 2013.

Broodstock management: Broodstock deployed in five haven estuaries, and managed by our Operations Manager. Handling protocols were written and distributed to carers. Quarterly on-site inspections, and regular phone and photo assessment maintained.

Strategic Plan: A four year (2014-2017) Strategic Plan approved by the Board outlines the company vision, mission, budget forecasts and SWOT analyses (Strategic Plan, appendix 1). Quarterly review by the Operations Manager and Board meetings.

Commercial hatcheries: SOCo work with five commercial hatcheries. We have provided broodstock spat production to three and maintain regular communication and invoicing system.

Spat supply: During this project (18 months), approximately 28,500,000 spat have been sold to industry. There were orders for at least a few more million, and more sales are expected before the end of the financial year. Industry has access to two lines of fast growing stock: B2 and WMR (selected for QX disease and Winter Mortality disease resistance respectively). Selected spat has been purchased by at least 42 businesses in NSW and QLD.

Communication: quarterly field trips in NSW for farm visits, customer feedback survey and weekly phone calls, bimonthly, if not more frequent, industry communication via emails, newsletters, company Snap Shot, company website, Twitter and FaceBook.

Industry field days: in 2014, two south coast field days, and in 2015 two upcoming (North

and South coast) field days. At each, SOCo presentations educate industry on the breeding program and hatchery supply, while gathering grower feedback.

Networks: establishment of a large network of research and industry bodies interested in SRO breeding projects including NSW DPI, Oysters Australia, OceanWatch Australia, Local Land Services NSW, FRDC, CSIRO, several universities and NSW TAFE.

ACKNOWLEDGEMENTS
We acknowledge the NSW DPI Port Stephens Fisheries Institute for their financial and in-kind support and commitment to the Sydney Rock Oyster breeding program. The DPI have partnered with SOCo to support research and development of mass selected and family lines, operational breeding procedures, and continued guidance on hatchery production and improvement of the program. The DPI have also provided a generous grant to help industry uptake selected lines of spat which has been beneficial to the program and the oyster farmers who purchase the stock. We acknowledge NSW Farmers Association for their secretarial support, lobbying support and guidance. We acknowledge Oysters Australia for the continued support of the Sydney Rock Oyster breeding program and providing direction that is in line with industry priorities. We acknowledge the FRDC and Seafood CRC for financial support of extension programs and the breeding program.

1. Introduction and Background

The Sydney Rock Oyster (SRO) breeding program began in 1990 under the direction of the NSW DPI (DPI). The program adopted a mass selection breeding program (MSBP) technique, and since it began significant progress has been made in providing fast growing and disease resistant SRO to industry.

A key priority for the **breeding program** was identified by the independent '**Morten Rye review** of Australian Breeding Programs for Pacific Oyster, Sydney Rock Oyster, Barramundi and Prawns CRC project 2008/769' stating*: "It is recommended that*... [industry]... *establishes a management team with the core responsibility to coordinate breeding program activities in close collaboration with PSFI* (NSW DPI) *and with technical input from a competent provider of quantitative genetic services (e.g. CSIRO)"*.

Select Oyster Company P/L (SOCo) is the commercial arm that manages the commercialisation of the breeding program. Established in 2004 by the Oyster Farmers' Association of NSW and NSW Farmers' Associations' Oyster Section with funding from the FRDC, and now owned by NSW Farmers Association. Following the recommendation of Dr. Rye, **an Operations Manager was engaged** to divest routine operations from the Board, and signal **industry's acceptance of and commitment** to the program.

Industry ownership and management of a MSBP program is an essential step in the commercialisation and retention of genetic gains for the industry. Commercial viability through industry ownership signifies successful adoption and use of previous investment. It also forms a development platform for the **transition** into a single pair mated family breeding program (FBP). A FBP is essential for the SRO industry as it can select traits such as **growth, diseases resistance, condition and shape, target commercially desirable characteristics identified by** estimated breeding values and effectively control inbreeding over the life of the program. The DPI has supported the establishment of the MSBP and the transition to FBP. **SOCo works in partnership with the DPI** as our operational breeder and research provider for the ultimate industry management and commercialisation of the family lines.

1.1 Need

To commercialise the MSBP and ultimately a FBP, the following recommendations were identified **as key priorities** and have been considered throughout the course of this program. Recommendations and any changes that arose during the project are listed here:

- Development of a **reliable hatchery technique** for a consistent high volume production of SRO spat, and a reliable source of supply which preferably should be a commercial hatchery and undertaken independently of SOCo. Currently one commercial hatchery is producing high volumes of spat, while two others are expanding to increase their production capacity. Each hatchery manages their production independently of SOCo; however SOCo offers broodstock, assistance in marketing, communications with industry and in facilitating training and extension services.
- Facilitate effective **family based multi-trait selection** (incorporating quantitative genetic advice).
- Prepare an **operational breeding plan** based on sound quantitative genetics and selection theory. An operational breeding plan is currently being developed with the support from DPI.
- Establish effective **data recording** (nucleus and performance testing) and database management systems.
- Establish a **management team** with the core responsibility to coordinate breeding program activities in close collaboration with DPI Port Stephens Fisheries Institute (PSFI) and with technical input from a competent provider of quantitative genetic services (e.g. CSIRO).

Furthermore, for industry to progressively adopt management and self fund the current MSBP breeding program, SOCo needed to appoint an **Operations Manager** which would provide a strong incentive for DPI to continue to invest in the family program. SOCo must also invest in program mechanics alongside private commercial investment in hatchery technique to address production barriers.

1.2 Objectives

This project has addressed the following objectives, to varying levels of completion as indicated in italics:

1. Implementation of protocols for broodstock management and perpetuation. *Achieved*.

2. Development of improved communication with end users with regard to availability, properties and management of available, selected stocks. *Achieved.*

3. Coordination of hatchery requirements with broodstock availability to improve supply. *Partially achieved, and ongoing.*

4. Development of human resources with shellfish specific experience. *Achieved and ongoing*

5. Introduce selected broodstock into more multiplier hatcheries. *Achieved and ongoing.*

6. Develop a platform to support delivery of outcomes of current research projects including the developing family breeding program. *Partially achieved.*

2. Methods

In order to address the project objectives listed above, the following core areas of focus were implemented.

2.1 Human Resources and Business Strategy

- **SOCo appointed an Operations Manager** (0.75 FTE) with expertise in oyster reef ecology, oyster aquaculture, disease management and bivalve hatchery production

operations. Under direction from the Board, the Operations Manager was tasked with routine operations, broodstock management, regular liaison with DPI and stakeholders, and communication with industry. She maintained regular communication with the Board including monthly progress reports, teleconferences and quarterly face to face meetings.
- SOCo appointed a new **Board of Directors** with shellfish aquaculture expertise.
- SOCo's four year **Strategic Plan** was written and published on the SOCo website www.selectoysterco.com.au.

2.2 Broodstock Management

- A **broodstock management** and maintenance system was designed and implemented for the mass selected broodstock lines (two lines). Five farmers were nominated as carers from five estuaries encompassing northern and southern NSW estuaries. Each carer is remunerated annually by SOCo.
- **Broodstock handling protocols,** and support for broodstock carers were implemented, including quarterly inspections by SOCo Operation Manger and assistance to the broodstock carers in handling, inspections, maintenance and movements by SOCo where required.
- A **relationship** was established between SOCo and **commercial hatcheries. Delivery of broodstock** to commercial hatcheries was coordinated as required by hatchery managers for commercial production. We discovered that delivering **conditioned broodstock on request is challenging** particularly during cooler months and therefore restricted the production of spat at peak demand times and reduction of customers. **Conditioning broodstock in hatcheries** should be a key research priority and methods to incorporate a **more efficient conditioning system** addressed.

2.3 Liaison with stakeholders

- **SOCo facilitated close liaison** with authorities including **DPI Biosecurity and Aquaculture Management** to ensure that the best risk management practices were implemented in the most timely fashion to ensure the perpetuity of the stocks. SOCo facilitated **protocol and permit development** to regulate broodstock and spat movement between NSW and Victorian Shellfish Hatchery, and between estuaries within NSW.
- SOCo maintained regular and working liaison with **DPI Aquaculture Research,** our operational breeders, to **coordinate breeding requirements** to ensure the perpetuation of the genetic gains including disease resistance and fast growth.
- SOCo maintained a regular liaison with **CSIRO** and DPI to identify breeding objectives and formulate a means to secure genetic services in order to deliver a commercial FBP.
- SOCo maintained regular communication with **Oysters Australia** to coordinate research funding priorities for the breeding program and hatchery capacity development.
- **SOCo** maintained regular communications with Seafood CRC (SCRC), and hosted two face to face meetings with our Program Manager Graham Mair, who received SOCo's industry updates. SOCo sought **guidance from SCRC** staff in business decisions including allocation of funds for extension projects in hatchery training.

2.4 Commercialisation and extension

- SOCo established a **marketing, education and communication** system with industry to raise the profile of the genetic gains of the MBSP and the FBP, and to increase sales of selected lines of seed.
- SOCo demonstrated **commitment to extension activities** with the aim to improve awareness and education of the breeding program and uptake of spat including hosting an aquaculture expert from USA on an FRDC visiting expert bursary.
- SOCo secured Hatchery Hub funds from the SCRC to implement hatchery training and capacity building through external consultant expertise.

3. Results and Discussion

Below the results of the project in relation to each objective are discussed.

1. Implementation of protocols for broodstock management and perpetuation. *Achieved.*

In late 2013, SOCo designed and implemented **a broodstock management system** to facilitate commercial production. The system includes:

- broodstock deployment in **five haven estuaries** in NSW to manage the risk of losses or biosecurity lock ups;
- Implementation of carer **handling protocols**;
- Annual remuneration for carers;
- Quarterly **inspections** by our Operations Manager and more regular and sporadic checkups with careers directly by phone and photographs where necessary.

Carers are diligent in its upkeep and always bring stock off the farm for inspections or photo evidence of condition on request by SOCo. There have been no major mortalities or stock losses due to diseases, theft, or misconduct. SOCo are pleased with the outcome of this broodstock management system from a logistical and systematic point of view, and would be happy to use this system for the care of family lines in the future. Conditioning broodstock (discussed in Objective 3) with this system is however still a challenge requires attention.

2. Development of improved communication with end users with regard to availability, properties and management of available, selected stocks. *Achieved.*

SOCo has built, grown and maintained several forms of communication with industry, including:

- Participation in **two industry workshops** hosted by South East Local Land Services in June 2014. SOCo presented alongside DPI to communicate progress in the MSBP and family breeding program, spat sales via hatcheries and nurseries, and other company initiatives. Similar presentations will be undertaken in 2015 oyster field day events. SOCo is currently involved in the organisation of Oyster Field Days in May 2015 in North and South NSW to launch the NSW Oyster Industry Strategic Plan. SOCo communicate with the organising committees (teleconferences, email, in person) and have secured presentation and a trade show at each to discuss all SOCo initiatives. SOCo is also ensuring that the breeding program is addressed in the Industry Strategic Plan through discussions with the committee chairs and consultant who's writing the plan.
- SOCo are managing a $50,000 **NSW government subsidy** administered by the NSW DPI and announced in March 2014. This subsidy rebates part of the cost of selected spat to farmers. In November 2014 we announced a second round and increased the rebate from $600 to $800 per customer to encourage uptake, however the uptake of this rebate has been slower than expected. 31 applications have been processed but only 20% of the funds have been spent. SOCo are considering increasing the quota again (i.e. $1000 per customer) or reallocate some of the money to other extension initiatives if approval is obtained.
- SOCo post **updates on our website** regularly including spat availability, hatchery and nurseries details, latest media releases, a testimonials page, updated contact information and useful links (DPI, forms, permits etc...).
- Quarterly **broodstock inspection trips** are undertaken which allows our Operations Manager to visit as many farms as possible en route.
- SOCo's industry contact list is currently **120+ growers** including email and phone numbers.
- In November 2014 SOCo launched a **customer feedback survey**; twenty survey responses have been collected so far. Generally, respondents indicate that reliability of supply is their main priority, followed by disease resistance and condition. A few growers have expressed their interest in diversification of stock including triploid SRO and Flat oysters (angasi). The best way to communication with growers is through the NSW DPI Aquaculture newsletters, and the SOCo website is also used by the majority of respondents. SOCo customer service was rated highly. We find the best way to collect answers is in person with the respondents and we continue to collect this feedback. Other industry feedback is consistent with these responses.

- **Social media**: SOCo launched a Twitter account in January 2015. Although this form of communication is not growers' choice, it has forged communications with processors restaurants, news agencies, government agencies and lobby groups (tweets: 459, following 157, followers 61). SOCo launched a FaceBook page in March 2015.
- Our **Company Snap Shot** was launched in March 2015. This is a one page overview of company news including spat for sale, research, the breeding program. It was distributed via email with hyperlinks for easy reading on smart phone and computer.
- SOCo maintains regular input to the biannual **industry wide DPI Aquaculture newsletter**, and quarterly updates in the **Shellfish Committee** and **Oyster Committee** meetings.
- SOCo participated in the **Australia's Talking Oysters video** Episode 2, which was sent to all OA contacts within Australia, posted on YouTube and our website.

In addition, SOCo have been actively involved in **several extension projects** during the course of this program, with the objective to increase industry capacity to uptake selected stock and facilitate awareness and improved capabilities within the industry. In June 2014 SOCo was successful in receiving **FRDC Visiting expert award** on behalf of the Australian Government to host Prof. Dale Leavitt from Roger Williams University Rhode Island, to undertake a road show of workshops and presentations in NSW, SA and TAS on floating upweller systems and alternative species cultivation. Dale visited hatcheries in NSW and TAS and several growers and industry bodies in each state. The program was well received and survey results from industry participants indicated a high level of satisfaction and support for such extension projects. Some farmers have taken the information to the next level and built prototypes upweller systems (videos available on SOCo website).

SOCo Board members and Operations Manager attended the **WAS2014** where SOCo co-chaired the oyster day and met with industry bodies from across Australia, including geneticists, ASI, FRDC, CRC and farmers.

Our Operations Manager was recently awarded the **ABARES Science and Innovation Award** to investigate how various husbandry techniques can be used to obtain good shell shape in selected lines of SRO, awarded by Dept. Agriculture for $22,000. Furthermore, SOCo have recently been granted CRC funding for a **NSW Hatchery Hub** program whereby a skilled consultant will visit hatcheries to offer technical advice, and public seminars will be hosted by universities, DPI and TAFES to attract students and offer open access information to industry bodies. This program is due to start in Winter-Spring 2015.

3. Coordination of hatchery requirements with broodstock availability to improve supply.
Partially achieved and ongoing.

SOCo have established and maintain relationships with **five commercial hatcheries** (detailed below)**, three of which are in commercial operation:** Southern Cross Shellfish (SCS), Camden Haven Oyster Supply (CHOS) and Victorian Shellfish Hatchery (VSH). SOCo maintains regular **communications with all hatcheries**, regardless of their production capacity in an effort to try and meet their needs and improve production capacity. Each hatchery that requests to use selected SRO broodstock for commercial production is required to sign a SOCo Customer Account Application (appendix 2). This is a legally binding agreement between SOCo and the guarantor (the hatchery). It places conditions on the use of SOCo product, that being selected lines of broodstock, and the sale of the oyster spat to customers.

In coordination of supply and demand, SOCo play an active role in linking growers with hatcheries, but SOCo do not manage grower orders or payments. **SOCo invoice each hatchery quarterly (0.2c/oyster)**, based on the number of spat (1mm retained) they have produced and sold to industry.

Thus it is so important to improve production from all three commercial hatcheries, and ideally more hatcheries, to increase while diversifying supply. SOCo recognised the importance of improving hatchery production through training and secured Hatchery Hub funding.

SOCo's agreed role is to provide access to broodstock for commercial production when and where required. **SOCo provide broodstock** to hatcheries at their request by sourcing the best naturally conditioned broodstock at the time via communication with carers and informed selected from inspection and/or photos of the stock. SOCo manage shipments, adherence to biosecurity protocols and broodstock movement logs. When the hatchery no longer needs the broodstock, SOCo manages the return of the stock to the carer.

In the 2013-14, 18,800,000 selected spat were sold to industry. For the 2014-15 FY to date (May 2015), 10,214,000 spat have been sold. Production only met half of industry demand due to a combination of **suboptimal broodstock condition and technical problems in the hatcheries.** The impacts of this shortfall on the longer term business plan are discussed in detail in section 6 of this report. Details related to each hatchery are outlined below.

VSH spawned for the first time SRO in Jan 2014 once protocols were sorted with the assistance and direction of SOCo. After a productive first SRO run in January 2014 (3 million spat) the VSH extended their floor space and capacity to produce larger quantities of SRO spat. They have maintained good communication with SOCo and their customers in NSW to facilitate best possible business relations and supply of spat. In January 2015 technical problems at VSH caused an unprecedented decline in production that could not be recuperated. VSH could not undertake a second run due to the **unusable broodstock condition and prior hatchery commitments** to produce other species. VSH is a quarantined system; it must filter and contain all water involved with SRO production, and therefore cannot produce SRO at the same time as other species. VSH have also provided procedural reports on hatchery operations and sought advice from DPI hatchery staff on **technical problems** and although there were production shortfalls, SOCo are confident that VSH are committed to producing SRO for the NSW industry in the future.

CHOS have attempted production runs during 2013, 2014 and 2015. However, due to **suboptimal broodstock condition**, water quality issues and **technical difficulties** the hatchery has not produced commercial quantities of spat. They have expanded the hatchery to increase capacity, and sought guidance from NSW DPI. They have a large customer base, both as a hatchery and a nursery and have expressed interest and support for extension and capacity building programs that could assist their production capacity. SOCo are confident that they are committed to production selected lines of SRO for industry.

SCS has been the biggest supplier of selected seed for industry. They have produced nearly all of the spat sold in 2014-15. SCS is located in Port Stephens and as a result of unfortunate mortalities in Pacific Oyster stock in 2014 due to unknown causes, some of the stock was not sold as industry arranged temporary closures of stock movements from Port Stephens for any oyster species. Furthermore, many customers in southern estuaries who ordered the Winter Mortality resistant line have not taken up available B2 (QX resistant line) spat which has impacted total industry sales this year. In response, SCS have attempted a recent Winter Mortality production run, however due to **suboptimal broodstock condition** in peak times (June – July 2014) and **water quality issues** in early 2015, a commercial WMR run was not achieved.

AquaFarms QLD is a commercial hatchery in Hervey Bay, QLD. They maintain regular contact with SOCo.

Smithies Hatchery is a commercial hatchery on south coast NSW which has produced commercial quantities of selected spat in the past; however they have not expressed any intention of producing in the last few years.

4. Development of human resources with shellfish specific experience. *Achieved and ongoing.*

An **Operations Manager** (0.75 FTE) was appointed in October 2013 for a two year term. The Operations Manager is based at DPI PSFI and regularly travels across NSW to undertake broodstock inspections, meet with farmers and conduct meetings. The Operations Manger is tasked with **regular communications and directions from the Board**, broodstock

management, communications with industry and authorities, and business development. In addition, a new Board was appointed consisting of oyster farmers, shellfish experts and a NSW Farmers Association representative. **A four year Strategic Plan** was written and implemented, including a SWOT analysis, budget, and production forecasts for 2014 - 2017. The Strategic Plan (without financials) was published on the SOCo website and available on request. A confidential copy (with financials) was delivered to DPI.

SOCo also explore **other business opportunities**. In 2014, SOCo managed the sale of flat oyster ***Ostrea angasi*** **spat** from the NSW DPI hatchery to a commercial nursery. This service generated a small income for SOCo via a levy. SOCo are considering options to expand our business model to include hatchery production of other species such as flat oysters, and this concept will be discussed at upcoming field days in May 2015. Breeding programs have not been discussed, but SOCo could facilitate hatchery-grower business relations and assist with protocol implementation to generate income from this service.

Triploidy: there is market demand for a disease resistant triploid SRO. SOCo have had discussions with SCS hatchery who wish to embark on R&D into triploidy induction using selected lines of SRO. SCS in consultation with NSW DPI and CRC have sought approval from SOCo to use selected lines of broodstock for commercial triploid production. A SOCo levy would be collected on spat sales. However, as no research has been done on the performance of triploid SRO, SOCo and the hatchery would implement a 'buyer beware' market strategy.

5. Introduce selected broodstock into more multiplier hatcheries. *Achieved, and ongoing.*

Before the program started, selected broodstock was being used by **two commercial hatcheries**; SCS and CHOS. Of these two, commercial scale runs were achieved only by SCS. Broodstock was also being spawned for commercial production in DPI PSFI hatchery, however, it has been the objective of this program and DPI to move production out of this hatchery and into **commercial hatcheries** to free up state resources to research and development of the FBP.

Since this program started eighteen months ago, a **third commercial hatchery** (VSH) has undertaken commercial production runs with selected lines of stock, and the working relationship between SOCo and other commercial hatcheries is improving.

6. Develop a platform to support delivery of outcomes of current research projects including the developing family breeding program. *Partially achieved.*

SOCo has been **liaising closely with the DPI** research team and with geneticists from the CSIRO to develop the family lines. SOCo facilitated and hosted a Family Breeding workshop in September 2014 in Sydney whereby CSIRO, DPI, CRC, ASI and Oyster Australia were invited to discuss progress in the family breeding program, and plan for the future commercialisation. At that workshop, and in communications since **estimated breeding values for disease resistance, growth and meat condition** has been determined and it's been identified that SOCo can achieve 7% gains concurrently in condition and growth in each generation.

SOCo has maintained communications with analogous **Pacific Oyster breeding provider ASI,** and our Operations Manager and Chair travelled to the ASI Business Development meeting in Hobart (March 2014). Our Operations Manager travelled to CSIRO Hobart (October 2014) to meet with geneticist and ASI to discuss the development of the family breeding program.

SOCo's Operations Manager **assists DPI** in the **experimental broodstock maintenance** in three rivers: Georges River where performance during QX and Winter mortality disease is assessed; Clarence River and Merimbula where broodstock families and MSPB lines are exposed to QX disease and Winter Mortality disease respectively, for selection of survivors for breeding the 6th generation of mass selected lines and founder families for the family breeding program which are expected to be available for commercial production in 2016.

SOCo's Operations Manager also assisted in the hatchery spawning of single pair crosses of families in January 2016, which has produced 46 families that are currently held in Port Stephens. In October 2014 our Operations Manager attended a two-day Breeding Focus, Breeding For Resilience workshop hosted by CSIRO, AGBU and UNE at Armidale UNE Campus. There she met several geneticists working in the livestock and aquaculture industries and forged relationships that she maintains on behalf of SOCo today.

Currently SOCo is in the process of **sourcing funding** that's needed for the **genetic services** that will inform breeding family selection, guide the next round of single pair matings in January 2016 and develop a data management system for the family breeding program, and resultant EBVs.

4. Benefits and Adoption

This investment has been of **huge benefit to SOCo**, the **SRO industry** and **industry bodies**. It has preserved and built on the legacy of the SRO breeding program that has been developing since 1990, and has since made significantly headway in providing a commercially available, fast growing and disease resistant animal for the SRO industry. Through the appointment of an Operations Manager, SOCo have been able to channel resources and energy into responding to industry and DPI needs; that is, commercializing an industry owned breeding program. During the past eighteen months since our Operations Manager started and since the appointment of new Board members, SOCo have received strong, **positive feedback from the industry**, reporting that SOCo's communications and responses to industry requests has **improved dramatically**. DPI have also indicated that the benefits to the breeding program are evident as the management of broodstock and relationship with the industry is improving, while commercial hatcheries are responding to industry needs so that the DPI can now channel their resources into developing FBP.

Encouraging progress has been made in terms of production and hatchery capacity. SOCo have built strong relationships with five commercial hatcheries, three of which are each pursuing selected lines for production to meet customer demands. SOCo have been able to trace the sales of selected lines of stock via government rebates and the customer feedback survey. Selected lines of spat have been taken up by at least 42 businesses mainly in NSW, and a few in QLD. SOCo are privy to the fact there were orders for approximately an additional 10 million spat this year, and therefore we expected sales of around 20 million spat however due to **suboptimal broodstock condition** and **hatchery technical issues** mentioned previously, this quantity of spat could not be produced. The NSW oyster industry employs 313 oyster farmers yet the supply of SRO is in deficit of demand by approximately 50%. Diseases have had a serious impact on production, and some farmers rely entirely on selected seed. The potential for growth in uptake of selected lines of spat is evident

This project has facilitated substantial non-market benefits particularly in the context of industry training and extension. In response to technical issues that have reduced hatchery production, **SOCo designed a hatchery training project, the Hatchery Hub** which aims to address specific hatchery needs and identify areas for operational improvement. This project has been developed in consultation with hatchery Operations Managers who have expressed their interest and support for extension opportunities to improve operations at each step of the way (conditioning broodstock through to nursery stages). SOCo has also discussed options with universities, the DPI and TAFE in order to extend the benefits of this project to the wider community and particularly youth who are interested in careers in aquaculture. The Hatchery Hub will **set standards** for hatchery procedures for the SRO industry and serve as a benchmark for future training schemes, including training of tertiary students. It is intended to also benefit hatchery profitability through spat sales in the shorter term.

The development and maintenance of an industry-owned and managed broodstock program implemented by SOCo during this project will serve the SRO industry in the future when it transitions into a FBP. While the market gains of the FBP are not immediately quantifiable, the non-market benefits through the gradual adoption of the FBP are already evident. The transition brings the SRO industry in line with other leading global seafood industries such as

Pacific Oysters, and salmon which use family breeding technologies for the most effective and targeted genetic gains. The FBP also addresses industry needs for an animal with commercially desirable traits which can be consistently produced on demand.

5. Further Development

The main areas of focus that require further development to secure the continuation of a commercial SRO breeding program for the industry are discussed here.

The first is **securing the production capacity** of commercial hatcheries. Currently, of the five commercial hatcheries which are permitted to produce SRO seed for the NSW industry, only one (SCS) has a production record that is indicative of its capacity to produce commercial quantities. It is important that **hatchery personnel** have the **technical skills** to enable production to be timely, reliably consistent and at full capacity. It is also very important that there are **several viable hatcheries** that can supply oyster spat to mitigate the impact of unprecedented biosecurity closures. As mentioned previously, SOCo have been granted CRC funding for a Hatchery Hub training program which should be implemented in 2015. This project will be a good starting point to develop standards for hatchery protocol and serve as a benchmark in hatchery capacity and industry uptake. **SOCo would encourage more training** initiatives of this nature as a priority for the SRO industry in order to uptake new technologies and forge collaborations within the industry to set common goals and standards.

As to be expected, **broodstock condition varies through time**, and between estuaries. At times the **timely condition required for successful spawning** has not been achieved and as a result, some production runs could not start, or produce the required quantities of spat. This is a problem particularly during winter when broodstock is needed most by hatcheries to supply industry in spring time. **Research in broodstock conditioning** techniques within hatcheries is of a priority. SOCo have raised this with DPI, Oyster Australia and been in contact with universities to collaborate on potential research projects. We have built relationships and maintain discussion with Southern Cross University Nation Marine Science Centre and the newly established Charles Sturt University Port Macquarie Campus. Further work is essential and a priority for SOCo, commercial hatcheries, nurseries and industry.

The development of the FBP is underway and a key priority for SOCo, the DPI and industry. Previous CRC R&D projects show that **pair-mated family breeding** for SRO can target known commercially desirable and heritable traits which include fast growth, disease resistance, meat condition and shell shape. To retain the genetic gains and continue the legacy for a commercial breeding program, **genetic services are essential**. Until now, DPI and external funding bodies have supported the establishment of this family breeding program, but in order for the program to become commercially viable it must be **industry managed and owned**. SOCo are pursuing ways to source, fund and manage the genetic services required and provide ongoing management of the program. To develop an industry-owned FBP for commercial use, genetic services are estimated to cost between **$30K - $50K per year**, over a period of three years. **Levies** generated from sales of spat from the MSBP lines are **insufficient**; at current production (~15-20 million spat per year) levies do not cover the costs of a geneticist, or SOCo Management staff. Therefore, **an injection of funds** to **secure genetic gains** would facilitate the transition into the FBP in order to provide improved lines of seed to industry in the short term. In the longer term, **reliable commercial production** necessary to generate sustainable levies is far more likely to be achieved if **hatchery training programs** that address technical shortfalls, **combined with access to conditioned genetically superior broodstock** are realistically attainable. SOCo is focused on addressing these reasons for production deficit in order to sustain a **commercially viable breeding program and pioneer a sound business model**.

6. Planned Outcomes

Below is a list of the project's original outcomes that were identified as key performance indicators, along with how the project outputs have addressed each of the outcomes.

• Successful production schedule for 2013/2014 breeding season, with confirmed supply of breeding stocks deployed to haven sites and improved seed available to growers from one or more hatcheries.

- This project deployed **broodstock in five haven estuaries**, and delivered to **three commercial hatcheries** during 2013/14 and 2015 production seasons. Over the course of the project (since Oct 2013) approximately 28,500,000 spat have been sold to industry.

• A commercially viable strategy presented to and approved by the SOCo Board.

- SOCo **employed an Operations Manager** in October 2013. A **four year Strategic Plan** (2014-17) was written and approved by the Board which outlines the business strategy. SOCo Operations Manager reviews the strategy and its targets to provide quarterly reports based on SWOT analyses and a 'traffic light system'. The Strategy is available on our website and open for review. SOCo are investigating ways to improve the business model. Currently, income is reliant on sales levies of selected spat. As supply has not met demand, levy revenue is not sustainable. Therefore ways of improving production capacity and implementing alterative business strategies such as the provision of a commercial hatchery supply chain of other species and triploid SROs are being considered by SOCo.

• Successful and consistent production of selected lines of SRO for supply to NSW Industry, by more than one hatchery.

- SOCo work with **three commercial hatcheries** to provide broodstock for production of spat for industry and kept in touch with two other hatcheries that have produced SRO in the past.

• Sales increased from 16 million spat in 2011/12 to 30 million by 2014/15.

In **2013/14 financial year 18,800,000 spat** were sold. To date, for the 2014/15 financial year 10,214,000 spat have been sold and it's expected that a few more million will sell before the end of the financial year based on the level of l inquiries from potential customers. One of the main reasons that target was not met, and reduced production compared to 2013/14 financial year is the fact that **DPI PSFI hatchery did a commercial** run in October of 2013 which produced over **half of the sales** for that year. By contrast, in 2014/15 sales were **entirely dependent on commercial hatcheries**, only one of which produced commercial volumes of spat. Each hatchery made several attempts at runs; however a combination of **suboptimal broodstock condition and technical issues** in the hatcheries hindered production. What SOCo have done in response is secure **Hatchery Hub funding** to try and address technical capacity issues in broodstock conditioning and hatchery operations through independent consultant assessments to being mid 2015. SOCo's business model addresses building hatchery capacity as a key factor in improving production and supply to industry, and identifies the need to focus resources into hatchery growth and diversification.

7. Conclusion

This project has implemented **key operational business procedures**, and with the appointment of an Operations Manager and direction from the Board has established the foundations for an achievable **industry-owned and managed SRO breeding program**. The project has identified strengths and weaknesses with the current business model. Strengths include a **logistically sound and manageable broodstock holding** operation whereby stock is **traceable and accessible** for commercial hatchery purposes, while also alleviating the DPI of commercial production pressures.. This in turn enables the channelling of state resources into the development of the FBP. SOCo have maintained **strong relationships**

with the DPI as our partner body and operational breeders to secure industry priorities in the SRO breeding program. Expansion of production to now include three working commercial hatcheries, and two non-working but equipped hatcheries has resulted from SOCo's commitment to work **alongside hatcheries**, to ensure we consider their business priorities when acting on our own. SOCo have built an expansive **network of oyster farmers and industry bodies** which is receiving positive feedback and an increasing level of inquiries; indicative of the industry's growing **acceptance of SOCo's position and services**.

This project has also identified **areas for expansion and key priorities** for the future. **Training** in hatchery techniques and capacity building are essential if the hatchery operations are to become viable. Furthermore, **broodstock conditioning** techniques in hatcheries and on leases requires research and development to improve broodstock availability on demand for peak production times. The transition into the FBP is already underway.This program will underpin the future of SRO breeding. However, **levies generated from current sales are not sufficient** to cover the costs of required genetic services or management staff and therefore SOCo are looking to external funding and alternative revenue-generating services the company could offer industry in order to secure the commercial viability and the future of the breeding program.

8. References

'Morten Rye 2014. Review of Australian breeding programs for Pacific Oysters, Sydney Rock Oyster, Barramundi and prawns' Seafood CRC 2008/769.

10. Appendices

Appendix 1. Staff List

Emma Wilkie Operations Manager Select Oyster Company

Jane Clout Chair, Select Oyster Company

Rachel King Oysters Australia

Appendix 2. Select Oyster Company Strategic Plan 2014-2017

Strategic Plan
2014-2017

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1. EXECUTIVE SUMMARY

The commercialisation of mass-selected Sydney Rock Oyster (SRO) lines is one key priority for the future of the breeding program and the perpetual supply of SRO single seed for the industry. The breeding program, developed by the NSW Department of Primary Industries, at the Port Stephens Fisheries Institute, must now be adopted by industry from the Department, to ensure investment in the future of the breeding program is allocated to R&D, and not used to fund operational duties. Furthermore, there is increasing uncertainty about the future commitment of public funding for R&D if there is no clear commercial outcome. Select Oyster Company (SOCo) adoption of the management of the breeding program will demonstrate to government and stakeholders that the industry is claiming responsibility for the program to secure its future and marketability.

The Morten Rye Review of Breeding programs (2011) focused industry attention on the benefits of adopting world best practice methods by leveraging the genetic gains from this mass selection program, and taking them forward under a breeding program based on family lines and single pair matings. Careful management of this program, and adequate data collection and analysis can deliver significant annual incremental gains in market driven desirable heritable traits.

The challenge for SOCo is production. The levy on sales of selectively bred spat is inadequate at current sales levels - all spat produced is taken up by the industry -to fully fund continued development of the mass selection lines and the development of family lines. Based on sales for the past two seasons a contribution of $26,000 to $31,000 from SOCo is possible to contribute to the operational costs of DPI NSW which is about $100,000 per annum for the mass selection lines.

There is scope for SOCo's contribution to grow in future years. At present about 20% of the spat estimated to secure future production and market supply annually, is sourced from selectively bred stock, with capacity for at least twice this proportion as records indicate that supply is in deficit of demand by approximately 50%.

Select Oyster Company (SOCo) Strategic Plan set over the next four years is the result of contributions from a range of SOCo stakeholders whose information was used as input to critically review and analyse external and internal factors. This culminated in the development of a SWOT analysis, objectives and actions for the next four years.

The Strategic Plan 2014-2017 identifies:-

- A viable future direction for SOCo
- Objectives through which we will deliver our mission
- Actions that flow from the objectives
- Time lines, Responsibility & Budget

1.1 Background – Industry, Environment and history.

Industry Background

The Australian Oyster industry comprises approximately 550+ farmers and businesses located mostly in NSW, South Australia and Tasmania with small production in WA & Qld. The net farm gate value is nearly $100 million and derived predominantly from family owned, owner-operated businesses. Over 97% of oysters sold in Australia are fresh ½ shells to end users with little value add.

Australia is a net importer of oysters with only 3% of production exported. Frozen half shell imports are from NZ and destined for WA & Qld. Imported canned product is from Asia.

The supply chain is complex, complicated by the market's reliance on a processed i.e. opened oyster. Between two and seven intermediaries are required to move oysters from growers to Australian consumers at various points of sale.

Although Sydney rock oysters (*Saccostrea glomerata* [SRO]) remain the most important commercial species, until recent disease outbreaks, the culture of Pacific oysters (*Crassostrea gigas*), particularly triploids, had increased significantly in NSW. Interest in cultivating other commercially important species, such as flat oysters, *Ostrea angasi*, has also increased.

Overall, since 2003 hatchery-produced oyster seed continues to become more readily accessible in NSW, particularly for SRO which, prior to 2003, had been largely unavailable to the majority of the rock oyster industry. Over the past 5 years, hatchery technologies and access to selectively bred brood stock have significantly improved. However from year to year, supply from hatcheries can be inconsistent and generally does not meet demand.

For both SRO and Pacific's, breeding programs have become an integral part of industry development and protection from disease and faster growth has been the primary reasons for hatchery seed uptake in NSW.

Across the oyster industry, the emphasis placed on the importance of demonstrating environmental sustainability has increased, and both industry and government have been proactive in protecting the estuarine environments in which oyster farming occurs. Collectively, hatchery development, oyster breeding, environmental management systems (EMS) and environmental research has "spawned" a number of new research initiatives that have increased fundamental oyster research during the past 5 years.

The Sydney Rock Oyster Industry (SRO) in NSW, the SRO industry turns over around 36 million dollars per year, and contributes substantially to the economies of many coastal communities.

Both annual production and the number of growers are decreasing. The current 350 (approx) number of growers is expected to halve in the next 10 years. This is driven by the increasing costs of doing business, particularly due to costs of regulation, and the competition from Pacific oyster market, making the margins tighter.

The awareness of the threat of QX disease, rapidly escalating operational costs and the added competition as a result of market penetration of Pacific oysters has resulted in a heightened awareness amongst growers that change in the industry is inevitable.

However, the fragmented nature of the industry, and relatively small size of most businesses when matched against the need for capital and management capabilities, makes the current commercial position of many of the growers in the industry very fragile. It is probable that a large proportion of the individual enterprises are not returning the cost of capital, and at some point, there may well be an exodus from the industry.

1.2 Select Oyster Company (SOCo) Background

In the 1990's, the NSW DPI established a selective breeding program to develop fast growing, disease resistant SRO. Initially, this program was based on mass selection, interbreeding large numbers of oysters that survived disease outbreaks.

Prior to 2003, commercialisation of the breeding lines was hampered by the failure of hatcheries to produce commercial quantities of spat. In 2003 the Aquaculture Research & Advisory committee and the NSW DPI invited industry hatcheries to produce commercial quantities of spat, the criteria adopted was the hatchery had to be successful in three out of four hatchery runs. In light of the success of this program the

Aquaculture Research & Advisory Committee and industry representatives asked to take over control of the broodstock.

With the improvements in technical and research support, the industry itself was to take the ultimate responsibility for the adoption of the results of the breeding program, and so the development of a commercial vehicle to take on the responsibility of breeding line management and distribution of resultant improved stock was coordinated.

The two industry associations (Oyster Farmers' Association of NSW and NSW Farmers' Association, Oyster Section) combined in 2004 to form the Select Oyster Company P/L (SOCo) to organise production and distribution of stock from the improved breeding lines and to ultimately take control of the management and future development of the breeding lines. With the establishment of SOCO, the breeding lines, developed by NSW DPI assisted with funds from the industry and Fisheries Research & Development Corporation (FRDC), have now been made commercially available to the oyster industry.

Through the original Strategic Plan, SOCo has surveyed industry requirements of the breeding program, and as such, has established the economic values of different SRO traits in order to determine the market sustainability of developing multiple lines with different traits, and to determine the optimum breeding objectives of different lines.

Under the NSW DPI breeding program the focus has been on the following objectives

- Evaluate alternative breeding methods, including single pair mating and mass selection, for the most desirable traits, as identified by industry (faster growth, QX disease resistance, winter mortality resistance etc).
- Review of breeding program designs and application of the best approach to develop a 10-year breeding strategy for SRO, in consultation with industry.
- To develop a risk assessment and reduction model against the loss of brood stock.
- To prepare a technical manual for the continued operation of an SRO breeding program.
- To prepare fully costed options for funding a breeding program for the next 10 years.
- Review the genetic status of the current breeding lines by examining genetic variation.

1.3 SOCo Details

Business Name: Select Oyster Company Pty Ltd

Business Structure: Australian Propriety Company limited by shares.

Registered in: New South Wales

ABN: 98 110 169 509

ACN: 110 169 509

Registered Office: Level 6, 35 Chandos St, St Leonards NSW 1590

Date Established 22 July 2004

GST: registered for GST

1.4 Office Holders

Jane Clout (Director) Jane manages oyster leases in Moreton Bay Queensland for over the last 12 years. She has represented the Queensland industry as Secretary to the Association, and is a member of the Australian Shellfish Quality Assurance Committee, and representative for the CRC Oyster Consortium.

Tony Troup (Director) Tony has owned and operated an oyster farm on the Camden Haven River, on the Mid-North Coast of NSW for 29 years. He is a member of NSW DPI's Aquaculture Research Advisory Committee, member of the NSW Shellfish Quality Assurance Committee and the NSW representative for the Seafood CRC Oyster Consortium.

Ana Rubio (Director) Ana has been involved with the Australian oyster industry for the last decade through her research into oyster productivity, husbandry and monitoring. She has worked on the development of Environmental Management Systems (EMS); has developed a prototype Information Portal for oyster farmers and has set up an array of innovative oyster monitoring programs based around commercial oyster graders.

Matt Wassnig (director) Matt is currently a director of a Sydney Rock Oyster farming business located on the NSW North Coast. Previous to entering the oyster industry he worked as an aquaculture research scientist and has completed a PhD in hatchery culture of pearl oysters. He is a member of the NSW Shellfish Committee and NSW Aquaculture Research Advisory Committee

Dave Barker (Director) Dave has a bivalve farm and leases in Woolooware & Quibray bays (Botany Bay). In addition he is the owner of an oyster and seafood processing plant. Dave has over 25 years of experience in marine aquaculture and commercial fisheries research with DPI.

Brad Evans is an applied geneticist with over 15 years experience and a PhD in aquaculture genetics. He has hatchery expertise primarily in the pearl oyster industry and several years experience in the operation and commercialization of selective breeding programs in shellfish and salmon working with CSIRO, SALTAS, universities and industry partners. He is currently the geneticist at Tassal Operations and manages the Tasmanian Atlantic salmon selective breeding program for Salmon Enterprises of Tasmania.

Anthony Sciacca is a third generation oyster grower and business owner from Wallis Lake. He has been part of several industry bodies including Chair of NSW Farmer's Oyster section, State SQAP, and local coordinator among others. He has been growing wild caught seed for the majority of his farming career, and grown SOCo stock for some time. He has seen great benefits in SOCo stock during recent years. He contributes a valuable 'on farm perspective' and champions the selective breeding program.

Luke Messer (Company Secretary) Luke is currently the general manager of corporate services for NSW Farmers Association with over twenty years experience in the area of governance for large corporations and the last five years focusing on not for profits.

1.5 Key Personnel

Emma Wilkie (Operations Manager) Emma has 5 years experience in the Australian oyster industry. Emma has a PhD on the sustainability of selective breeding for QX disease-resistance for the SRO industry. Her background includes project management, industry liaison, networking and conference presentation both in Australia and overseas, and community engagement. Emma is based in NSW DPI Port Stephens Fisheries Institute, and works closely with NSW Farmers and oyster consortium groups. She regularly travels to oyster farms throughout NSW to monitor broodstock, network with industry and provide knowledge of SOCo activities.

2.1 SWOT Analysis

Internal / External	Strengths	Weaknesses
	1. Selective breeding is the main strategy to sustain the productivity of the SRO industry	1. SOCo's role unclear
	2. Exclusive access to genetic superiority spat	2. The breeding program is currently not structured
	3. The selected lines capable of commercialisation	3. Lenient rules on payment.
	4. Higher cash flow from an investment in spat over the current wild caught spat.	4. Revenue model will not sustain a full commercialization.
	5. SOCo has the unqualified support of all stakeholders. SOCo seen as insurance against QX.	5. Not sufficient potential market to cover the running costs of a management and research infrastructure
		6. Unknown nature of the contracts /proprietary rights
Opportunities	**Strategies - S/O**	**W/O**
	1. Commersialisation plan to secure R&D funding & future financial viability. (S3 O2)	1. Indentify opportunities to demonstrate SOCo role in driving productivity and profitability. (W1, O2)
2. Production at 1950's level, consumer demand still high	2. Develop a breeding program to accelerate the genetic gains (growth & disease) achieved via selective breeding (S1, O1, O4)	2. Develop a breeding program to drive productivity (thru growth rates & disease resistance). (W2, W4, O1), (W6, O5)
3. Growers are aware of and concerned about QX,	3. Educate growers on the advantages of selectively bred oysters. (S5, O5)	3. Highlight genetic superiority in order to deliver commercial benefits to farmers (W3, W5, O4, O2)
4. The fast growing and disease resistant characteristics of the spat emerging from the research programs		4. Develop a nursery management plan (W1, W3, O5)
5. New business models may emerge as a result of the move to hatchery seed (both SRO & Pacific)		
Threats	**S/T**	**W/T**
1. Risk that Government will withdraw from the breeding program.	1. Promote the value proposition of selective breeding (profitability, disease resistance. (S1, T7), (S5, T1, T2)	1. Clarify the role of SOCo to drive the benefits of selective breeding for the industry's future. (W1,W2, T1)
2. The size of the industry will have trouble funding the necessary R&D, and IP management.	2. Form alliances with commercial hatcheries to drive & demonstrate benefits of SOCo oysters. (S2, T4, T7, T8), (S3, T3, T5, T6)	2. Secure long-term funding arrangements for industry development activities (sustainability, local employment, export & domestic markets). (W4, W5, T1)
3. Commercial hatchery are not consistently meeting current demand	3. Assume mamangement of Mass Selected Breeding Program (S3, T1)	3. Open & continual dialogue between growers, hatcheries, nurseries & SOCo. (W1, W9, T5, T6, T7, T8)
4. Reduced profitability at the time when investment to fund the change from sticks to single seed is increasing.	4. Explore extension of statutory research bodies until SOCo spat reaches targeted market share level (S4, T2)	4. Develop business systems to ensure transparency & ability to measure & evaluate SOCo performance. (W1, W3 T3)
5. The Pacific oyster "exports" (to NSW) creating downward pressure on margins	5. Plan for managemnt of the family lines breeding program by 2017 (S1, S3, T1, T2)	5. Explore extension of statutory research bodies until SOCo spat reaches targeted market share level (W4, T1)
6. Declining recognition amongst consumers of SRO as a distinctive variety of oyster		
7. Little acknowledgement of the costs to collect that "free" spat.		
8. The increasing probability of outbreaks of disease.		

2.2 Risk Action & Management Plan

Risk	Likelihood	Consequence	Mitigation
Outbreak of disease	**Almost certain**	**Critical**	Breeding program focus on disease resistance
Pacific Oyster taking market share from SRO	**Likely**	**Major**	Breeding program focus on growth, shape and communication & facilitation of Sydney Rock Oyster spat
Reduction in government funding	**Likely**	**Major**	Source external industry and NGO funding, increase the supply of hatchery spat, increase levy
Levy collection falls below cash flow requirements	**Likely**	**Major**	Increase levy. Seek NGO/industry funding. Seek Government funding
Success is dependent on hatcheries	**Likely**	**Major**	Maintain good communications with the hatcheries; work with more than one hatchery (currently 4). Know hatchery needs and prioritise to work together.
Lack of knowledge about family lines as there is no successor of current geneticist who knows the family line data	**Possible**	**Major**	Source at least one additional potential geneticist before July 2014. Introduce them to the data and current geneticist to be trained where necessary by 2015
Reduction in the number of nurseries	**Possible**	**Major**	Provide education on ways to grow young oysters without the need of nurseries. Longer term provide nursery development workshops. Work with the government to increase the number of nursery permit holders in the state. Advertise the substantial cost benefits of nursing spat from young age
Loss of operations manager	**Remote**	**Major**	Document policies & procedures and through the board maintain relationships.
SOCo cannot develop good linkages with all hatcheries and oyster brands	**Remote**	**Major**	Effective, regular communications with the hatcheries. Know the hatcheries priorities.
Perception of SOCo stock	**Likely**	**Minor**	Marketing & prioritise communications and education about improved growth and handling techniques.
Lack of visibility of the success of SOCo stock	**Likely**	**Minor**	Focus on improved communications highlighting sales growth, expansion of hatchery network, grower interaction opportunities, publicise survey results.

Risk profile

	Extreme
	High
	Medium
	Low

3. OUR STRATEGY

3.1 Vision & Mission

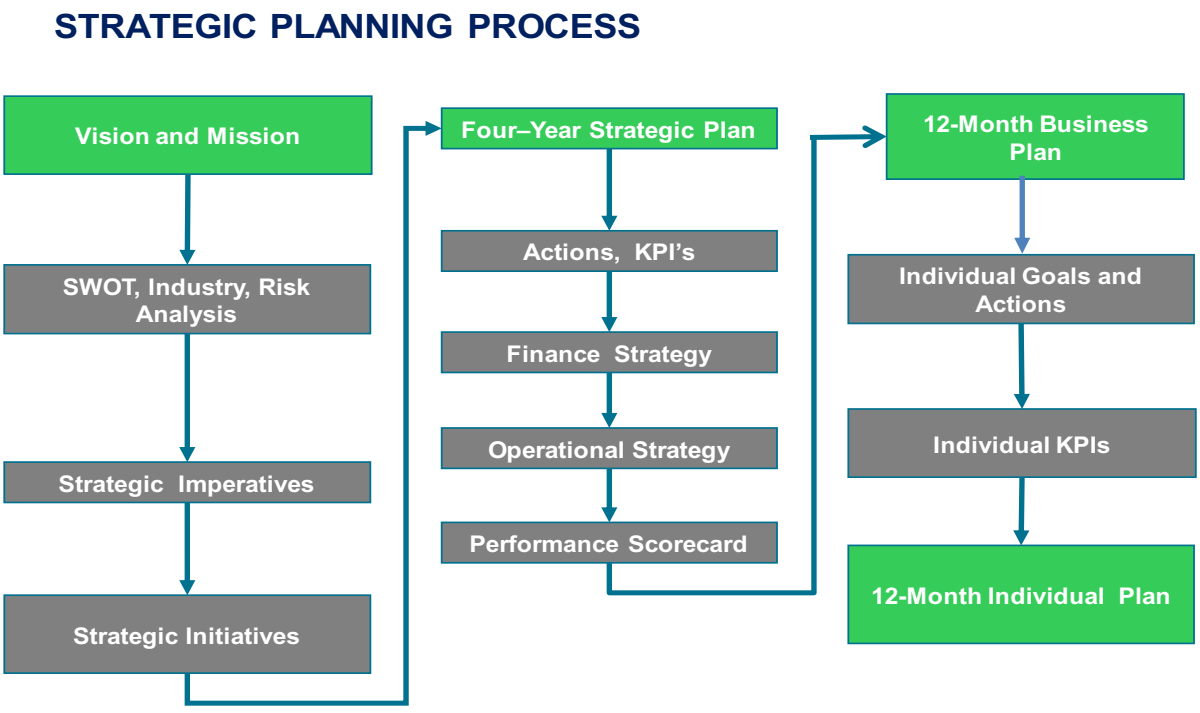
Vision Statement
(where we want to be)

SOCo partners with DPI in a best practice breeding program which manages and safeguards selected lines of hatchery produced breeding families and supplies broodstock to hatcheries for the production of commercial quantities of improved oyster into the marketplace."Oysters produced under the SOCo breeding program are acknowledged for their genetic superiority and improved marketability".

Mission
(why we are here)

"The Select Oyster Company exists to protect and perpetuate breeding lines and families of SRO and enable the introduction of desirable, sustainable, heritable traits to improve growth, marketability, and the risk profile of the Sydney Rock Oyster."

Linking our Strategic Plan with our Business Plan



3.2 Strategic Imperatives (see Strategic Plan)

In 2014, SOCo undertook an organisational review of its Strategic Imperatives and what they mean to our Board and staff. This resulted in the restatement of our imperatives for the next 4 year plan.

Our Imperatives are:-	What does SOCo mean by this?
Commercial Return	Achieve financial independence within 4 years, such that the transfer of IP and responsibility for the management of the breeding program by SOCo is feasible.
Viability	• By 2015 assume complete management of the Mass Selected Breeding Program • By 2017 assume complete management of the Family Lines Breeding Program
Reliability	• Availability of Stock • Reliability of Number of Seed • Reliability of Delivery • Reliability of Performance
Awareness	• Provide a leadership culture across R&D, advocacy and market investment strategies by ensuring linkages are maintained with stakeholders

The Strategic Plan 2014-2017 identifies four strategic Imperatives as the key drivers for developing our strategies and goals over the next four years. These imperatives are further broken down into initiatives which have been identifies in the SWOT analysis:

Strategic Imperatives	Strategic Initiatives
Commercial Return - delivering commercial return & sustainability	• *Commercialisation plan* • *Secure long term funding* • *Develop business systems* • *Explore extension of statutory support*
Viability - develop a commercially viable breeding program	• *Clarify the role of SOCo* • *Develop a breeding program to accelerate the genetic gains (growth & disease)* • *Develop a breeding program to drive productivity* • *Management of the mass selected family breeding program by 2015* • *Plan for the management of the family lines by 2017*
Reliability - develop a reliable & transparent supply	• *SOCo role in driving productivity & profitability* • *Highlight commercial benefits to farmers* • *Hatcheries strategy* • *Nurseries strategy* • *Create a value proposition for the SRO industry*
Awareness - drive awareness & understanding	• *Educate and remove false myths* • *Central point of communication*

Each objective is further broken down into actions which drive the development of Select Oyster Company annual business plan.

INITIATIVES	ACTION	TIMING	WHO	BUDGET
3.21 – Delivering Commercial Return & Sustainability				
	Commercialisation plan to secure R&D funding & future financial viability			***ref s/o1***
Strategic Plan	To determine the best methods for use and protection of existing & future intellectual property for industry development.	June 2015	Board	
	Prepare a detailed 4-year operational and cash-flow budgets for the operation as basis for a realistic assessment of the funding needs for the SRO breeding program	June 2014	Board	
Industry Funding	Agree pricing policy into the future. Potential to increase levy once production issues are over come and demand increases	Dec 2016	Board	
	Build case & communicate with growers at each step, for a national levy comprising R&D, 'biosecurity' and marketing & promotion components.	Dec 2016	Board	
	Secure long-term funding arrangements for industry development activities (sustainability, local employment, export & domestic markets)			***ref w/t 2***
Long – term funding	Develop effective, long term funding mechanisms for industry development activities. Fisheries Research & Development Council (FRDC) & Aqua Culture Research Advisory Council (ARAC)	Dec 2014	Board	
	Continue to build scientific and management collaboration with NSW DPI and FRDC (Graham Mere), recognizing that the relationships will need to be sustained into the long term.	Ongoing	Ops Mger	
	Develop business systems to ensure transparency, ability to measure & evaluate SOCo performance			***ref w/t 4***
Data Collection	Establishing effective data recording and database management systems of the SOCo spat supply chain from batch to grower	Dec 2014	Ops Mger	
	• Brood stock registry • The numbers that carers hold at any given time • Tracking of shipments to hatchery	Complete Complete Complete		

INITIATIVES	ACTION	TIMING	WHO	BUDGET
3.22 – Develop a Commercially Viable Breeding Program				
	Clarify the role of SOCo to drive the benefits of selective breeding for the industry's future			***ref w/t 1***
SOCo management of the breeding program	SOCo driving the process to ensure that the selection program is developed in line with the SRO industry's long term needs and priorities. Influence and input to the Fisheries / Macquarie Uni genetic marker study.	Dec 2015	Ops Mger (Mac Uni / Fisheries).	
	SOCo has approved evaluation of alternative methods for selection for the most desirable traits, as identified by industry from ***industry survey*** (faster growth, QX, disease resistance, winter mortality resistance etc).	June 2014	Ops Mger	
	Develop a breeding program to accelerate the genetic gains (growth & disease) achieved via selective breeding			***ref s/o2***
Accelerate the genetic gains	Maintain a watching brief on the Macquarie Uni review of the genetic status of the current breeding lines by examining genetic variation between wild and selected stock	Launch 2014 4 year program	Ops Mger, Ana Rubio	
	Investigate ways in which mortalities can be efficiently recorded & interpreted. Capture this information via ***industry survey***	June 2014	Ops Mger	
	Develop a breeding program to drive productivity thru growth rates and disease resistance			***ref w/o2***
Drive productivity	Ensure marketable characteristics (condition, texture, colour, uniformity) are not lost when breeding for survival via the ***industry survey***	Dec 2014	Ops Mger	
	Maintain brood stock available for hatcheries.	Ongoing	Ops Mger	
	Deploy current brood stock to brood stock holders and coordinate the provision of this genetic material to hatcheries.	Ongoing	Ops Mger	
	Have in place a plan for brood stock distribution among 5 carers, and review and source new carers with appropriate protocols if the need arises.	Ongoing	Ops Mger	

Assume Management of the Mass Selected Breeding Program				***ref s/t 3***
Delivery of CRC commercialisation program in 2015	Deploy current brood stock to brood stock holders and coordinate the provision of this genetic material and liaise with hatcheries as required	Complete	Ops Mger	
	Coordinate breeding requirements to ensure the perpetuation of the genetic gains;		Ops Mger	
	Develop a risk assessment and reduction model against the loss of brood stock. ***The brood stock is currently held in 5 different haven estuaries and monitored by SOCo.***	Completed	Ops Mger	
	Coordinate production of 2 lines (WMR and B2?) of future generations of MSBP breeding stocks through development and implementation of a production schedule for the breeding season.	Dec 2015	Ops Mger	
	Develop practical management and maintenance guidelines for the MSBP brood stock and for the implementation of handling protocols among brood stock carers.	Completed	Ops Mger	
	Introduce selected brood stock into more multiplier hatcheries to act as "herd test" farmers to enable more data on genetic traits being measured.	Completed	Ops Mger	
	Expansion of access to brood stock to other commercial hatcheries so that the selected lines form part of the product offering to industry will consolidate the risk management options available to SRO farmers. Two extra hatcheries introduced.	Jun 2014	Ops Mger	
Establish a plan for the management of the family lines breeding program by 2017				***ref s/t 5***
Future management of family lines	Develop a business plan to support delivery of current research projects including the developing family breeding program. The plan to factor in the provision of genetic advice	Jun 2015	Ops Mger	
	Provide opportunities for SOCo to cost and access any future genetic services.	Jun 2015	Ops Mger / Jane Clout	
	Complete the process of restructuring the breeding program in order to facilitate a move from mass-selected lines to effective single-pair mated family based multi-trait selection.	Jun 2017	Ops Mger / Jane Clout	

	Physical control of the brood stock from which the selected lines are bred transferred to SOCo. Cost $5,600 (8 inspections for 2 years @ $700/ inspection plus $5,000 one off payment to brood stock carers	Ongoing	Ops Mger	$10,600
	Agreements for securing long-term access to quantitative genetic competence for routine data analysis and breeding value estimations, support selection decisions in breeding nucleus and dissemination, etc.	In progress	Ops Mger / Jane Clout	
	Scientific and process knowledge crucial to propagation of selected lines, successfully transferred to SOCo	Out of scope of 4 year plan	Board	
	Establish management personnel with the core responsibility to coordinate breeding program activities in close collaboration with PSFI and with technical input from a competent provider of quantitative genetic services (e.g. CSIRO). A 2 year fixed term contract to Oct 2015 is in place.	Completed	Board	
	Prepare an operational breeding plan based on sound quantitative genetics and selection theory. Including an external contractor / geneticist.	Dec 2017	Ops Mger / Jane Clout	
	Establish an operational agreement with a geneticist to effectively access, utilise and manage family line database.	Jun 2016	Ops Mger	

INITIATIVES	ACTION	TIMING	WHO	BUDGET
3.23 – Develop a Reliable & Transparent Supply				
	Indentify opportunities to demonstrate SOCo role in driving productivity and profitability			***ref w/o1***
Productivity & profitability	A simple series of handling and hygiene management protocols developed and imposed on the nurseries buying stock for resale. They could be registered by SOCo as a "SOCo value chain partner", which has marketing benefits for all concerned, as well as building reliability of spat performance. Discuss with DPI - 2008 DPI video	June 2015	Ops Mger	

	Initiate a collaborative effort amongst growers. This may include consideration of alliances with Oysters Aust in export markets, and complementary products (wine, finger limes, and others) elsewhere	TBC, ongoing	NSWFA Oyster committee	
	Initiate a value chain initiative to support export growth. Funding will need to come from either DAFF or NFIS, with NSW DSRD or Agriculture as further options. Commercial funding of these projects will require matching funding by growers	TBC, ongoing	NSWFA Oyster committee	
	SRO growers, led by SOCo to form an alliance with Pacific Oysters suppliers in export markets, offering customers a choice of product	TBC, ongoing	NSWFA Oyster committee	
	Highlight genetic superiority in order to deliver commercial benefits to farmers			***ref w/o 3***
Highlight Commercial Benefits	Establish ongoing effective processes for growers to provide input into priorities and project areas via ***industry survey***	Dec 2014	Ops Mger	
	Drive production targets through liaison with industry to market genetic qualities and advantages, and develop a better understanding and awareness of the benefits and availability of improved lines	Dec 2014	Ops Mger	
	Identify strategies to maintain traceability & transfer of origin info of oysters along the supply chain via Survey & Levy	Jan 2014	Ops Mger	
	Show the benefit of the fast growing and disease resistant characteristics of the spat, via the LLS project with the south coast grower	Dec 2015	Ana Rubio	
	Form alliances with commercial hatcheries to drive & demonstrate the benefits of SOCo oysters			***ref s/t 2***
Hatcheries	Develop a better understanding of the existing capabilities of the hatchery industries through site visits and performance monitoring	On going	Ops Mger	
	All hatcheries subject to a contractual arrangement, review exiting contracts	Jun 2014	Luke Messer	
	Undertake audits & site inspections of hatcheries	Twice yearly	Ops Mger	
	Undertake onsite training with hatcheries.	Dec 2015	Ops Mger	
	Look at ways to condition brood stock which is the responsibility of the hatcheries but monitored by SOCo	Jun 2014	Ops Mger	

	Implement data recording from hatcheries that ensures counts are accurate and the nursery got what they ordered, they got the right line, that survival and health doesn't impact on the number that they wanted via the ***industry survey***	Dec 2014	Ops Mger	
Develop a nursery management plan				***ref w/o 4***
Nurseries	Consider using more nurseries to reduce risks of lock down such as workshops to introduce new methods / technology e.g. FLUPSY	July 2014	Ops Mger	
	"Licensed" nurseries should be subjected to a rigorous set of quality and process standards that should probably be an addendum to the MOU.	Jun 2015	Ops Mger	
	Put in place a set of protocols for use by nurseries in handling SOCo stock. These protocols can be displayed on the website, acting as a brand building activity	Jun 2015	Ops Mger	
	Communicate to the industry end users regarding availability of hatchery production stock and information on performance of the commercial and family lines via SOCo web and other SOCo communications.	Jun 2014	Ops Mger	
Promote the value proposition of selective breeding (profitability, disease resistance)				***ref s/t 1***
Value Proposition	Replacing the current "serious but it won't happen to me" attitude about the potential impact of QX and WMR amongst growers, with the attitude that SOCo stock provides mitigation of the risk.	Dec 2016	Board	
	Assist with reducing the costs of farming (measured thru benchmarking, etc) by sharing information on SOCo products.	Dec 2014	Ops Mger	
	Investigate, communicate, grow out techniques that improve stock performance and survival (i.e. as shown by benchmarking results)	Dec 2015	Ops Mger	
	Investigate, communicate, spat production techniques (hatchery & wild caught) that improve stock performance and survival via hosting workshops e.g. FLUPSY technology	Ongoing	Ops Mger	

INITIATIVES	ACTION	TIMING	WHO	BUDGET
3.24 – Drive Awareness & Understanding				
	Educate growers on the advantages of selectively bred oysters			***ref s/o 3***
Educate	SOCo project manager undertake genetics training under the Aquaculture Innovation Hub Project and Macquarie University training scheme. .	Start Jun 2104	Ops Mger	
	Building an information base that accurately records the performance of SOCo stock, and the benefits that flow from use of the seed via the ***industry survey***	Dec 2014	Ops Mger	
	Educate to change the entrenched views about the performance of the fast growing spat, and the counts that come from the nurseries, which are qualitative rather than fact based through benchmarking and communication., via the LLS project with the south coast grower, video, web , press releases & industry survey	Ongoing	Ops Mger	
	Facilitate greater levels of knowledge dissemination among growers of successful and unsuccessful production practices, via industry survey, workshops, field days & LLS project	Ongoing	Ops Mger	
	Show the calculations of value of the fast growing lines to benefit their cash flow or capital employed	TCB, ongoing		
	Open & continual dialogue between growers, hatcheries, nurseries & SOCo.			***ref w/t 3***
Communicate	Co ordination of hatchery requirements with brood stock availability to improve supply.	Ongoing	Ops Mger	
	Liaison with industry and hatcheries to drive the best outcomes in relation to availability and timing of delivery of seed stocks.	Ongoing	Ops Mger	
	Notifying nurseries that a run is occurring	Ongoing	Ops Mger	
	Liaison with hatcheries and nurseries to ensure the integrity of lines produced and the recording of outputs.	Ongoing	Ops Mger	

	Communication with growers. Communicate hatchery run schedules, R&D development, rebates/offers, website	Ongoing	Ops Mger	
	Develop effective communication between the breeding program operations and the intermediate and end users of the seed in the sector via the ***industry survey***	Dec 2014	Ops Mger	
	As it affects SOCo provide a leadership culture across R&D, advocacy and market investment strategies by ensuring linkages are maintained with other state organizations**.**		Board	

3.3 Financial Summary 2014-2017

The Strategic Plan 2014-2017 is underpinned by robust financial projections to ensure SOCo has the financial ability to deliver our Plan. We have provided Financial Projections on a 'Business as Usual' (BAU) and 'High Growth & Breeding Plan Scenarios' basis.

Select Oyster Company Projections - Business as Usual Scenario						
Assumptions						
Market Growth	0%	0%	0%	0%	0%	
SOCO Spat Growth	16%	16%	16%	16%	16%	
Levy on Sales	$0.002	$0.002	$0.002	$0.002	$0.002	
Industry Production Data						
Financial Year	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	Notes
Spat production (1000 micron retaine	18,036,000	20,980,831	24,406,480	28,391,452	33,027,072	1
Industry Production (mature)	64,806,372	64,806,372	64,806,372	64,806,372	64,806,372	2
Size of market for juvenile oyster	97,209,558	97,209,558	97,209,558	97,209,558	97,209,558	3
SOCo share of hatchery market	19%	22%	25%	29%	34%	
Proposal Budget Projections						
Current Levy on sales						
Financial Year	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	Notes
Income						
Levy on Production	$45,279	$41,962	$48,813	$56,783	$66,054	
Proposed Contribution by CRC	$85,000	$95,000	$0	$0	$0	
Other	$16,780	$6,993	$7,203	$7,419	$7,642	
Total	$147,059	$143,955	$56,016	$64,202	$73,696	
Expenses						
Employment & On Costs	$44,622	$63,712	$65,623	$67,592	$69,619	4
Office & General Expenses	$15,098	$4,969	$5,118	$5,272	$10,443	
Representative Costs	$8,810	$8,991	$9,261	$9,538	$9,824	
CRC Project Costs	$47,080	$8,500	$8,500	$8,500	$8,755	
Breeding Program					$0	6
Total	$115,610	$86,171	$88,502	$90,902	$98,642	
Surplus/(Deficiency)	**$31,449**	**$57,784**	**($32,485)**	**($26,699)**	**($24,946)**	

Notes to Select Oyster Company Projections	
Note 1	
2011/2012	Production improvements but demand exceeds supply, and early season runs fail so production is not available until late in season
2012/2013	Current figures not complete, hatchery sales increasing. At reporting, 3 successful production runs, 2 of which were selected stock, and 1 more planned
2013/2014	Estimate increased sales - POMS outbreak in Hawkesbury River risk management strategy; SOCo resourced to improve broodstock availability and improve
2014/2015	Conservative assumption - production levels are maintained
Note 2	Latest published production figures available are 2011/2012. These are mature stock sold for consumption and take up attrition through the growing cycle.
Note 3	Assume a 30% attrition rate from hatching to dispatching
Note 4	**Costed at 22.5 hrs/week @$46.00 per hour, and reducing to 15 hours per week in**
Note 5	In kind contribution by PSFI
Note 6	Potential CRC bid by CSIRO to establish service provider. Costings not currently
Note 7	Assume 5 Broodstock holders
Note 8	Assume 4 board members and a physical meeting twice per year
Note 9	Assume holding of 2 lines and 10,000 animals and 2 efforts, one to produce next
Note 10	Assume Port Stephens or Sydney meetings

High Growth & Breeding Program

Assumptions					
Market Growth	0%	0%	0%	0%	0%
SOCO Spat Growth	16%	16%	16%	16%	16%
Levy on Sales	$0.002	$0.002	$0.002	$0.002	$0.002
Industry Production Data					
Financial Year	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Spat production (1000 micron retained)	18,036,000	20,980,831	24,406,480	28,391,452	33,027,072
Industry Production (mature)	64,806,372	64,806,372	64,806,372	64,806,372	64,806,372
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Proposal Budget Projections					
Current Levy on sales					
Financial Year	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Income					
Levy on Production	$45,279	$41,962	$48,813	$56,783	$66,054
Proposed Contribution by CRC	$85,000	$95,000	$0	$0	$0
Other	$16,780	$6,993	$7,203	$7,419	$7,642
Total	$147,059	$143,955	$56,016	$64,202	$73,696
Expenses					
Employment & On Costs	$44,622	$63,712	$65,623	$67,592	$69,619
Office & General Expenses	$15,098	$4,969	$5,118	$5,272	$10,443
Representative Costs	$8,810	$8,991	$9,261	$9,538	$9,824
CRC Project Costs	$47,080	$8,500	$8,500	$8,500	$8,755
Breeding Program			***$17,000***	***$53,000***	***$54,590***
Total	$115,610	$86,171	$105,502	$143,902	$153,232
Surplus/(Deficiency)	**$31,449**	**$57,784**	**($49,485)**	**($79,699)**	**($79,536)**
Surplus/(Deficiency) levy at $.003			($25,079)	($51,308)	($46,509)

Notes to Select Oyster Company Projections

Note 1

2015 SOCo takes over the management MSBL

2017 Family Lines become commercially available

33% - market share by 2017

DPI to continue to provide breeding services to the program at not charge

Note 2 — Breeding Program Costs:-

	MSBL Only		Incl Family Lines
MSBL from 2015/2016	$0	Broodstock Manager	$0
Family Lines from 2016/2017	$14,000	Data Collection	$0
	$0	Genetic Services	$50,000
	$0	Industry Liason / Conference	$0
	$3,000	Depreciation	$3,000
	$17,000		$53,000

These figures are estimates and need to be confirmed as the operational plant bring the family lines becomes more concrete.

Appendix 3. Select Oyster Company Customer Account Application form

The actual SOCo's Customer Account Application form was unable to be included in this Appendix. It is a legally binding contract between SOCo and the guarantor (the hatchery) that places conditions of the use of SOCo product and the sale of oyster spat to customers.