Corporate Report

NO: C007

COUNCIL DATE: March 3, 2003

COUNCIL-IN-COMMITTEE

TO: **Mayor & Council**

DATE: **February 27, 2003**

FROM: **General Manager, Engineering**

FILE: **6520-20(EC)**

SUBJECT: **East Clayton Neighbourhood Concept Plan (NCP) Stage 2 Engineering Servicing Plan**

RECOMMENDATIONS

1. That Council adopt the engineering servicing and financial strategies as outlined in this report and as specified in East Clayton NCP as the means of managing engineering services for this neighbourhood;

2. That Council adopt a staged approach to sustainability by requiring all development in East Clayton to provide the base level of sustainability as described in this report; and

3. That all development in East Clayton NCP be required to provide the enhanced level of sustainability as described in this report until grant funding for the on-lot infiltration devices is exhausted.

INTENT

The purpose of this report is to:

1. Provide Council with an overview of the engineering servicing and financial strategy for East Clayton Neighbourhood Concept Plan (NCP) Study Area; and

2. Seek Council support for one of the sustainability strategies presented in this report.

BACKGROUND

The Proposed Land Use Concept Plan for the East Clayton NCP is being presented for approval in a separate Corporate Report from the General Manager of the Planning & Development Department. This report outlines the engineering servicing issues and financial issues that are included in the East Clayton NCP.

DISCUSSION

The engineering services discussed in the report relate to major community infrastructure. Only those work, which are presently in or could be added to the 10 Year Plan and funded through Development Cost Charge (DCC) program are discussed in detail. Local site servicing requirements of individual developments are not analysed in the report.

Unlike most other NCP study areas, East Clayton has a number of unique features and challenges:

- Extensive sustainable initiatives throughout the NCP;
- Significant down stream drainage constraints;
- Topography dictates two main servicing catchments areas; and
- Due to the existing rural residential use, limited services are currently available.

Sanitary Sewer

Currently, septic fields service most of the NCP area. Under the proposed plan two sewer systems will serve the NCP area: the recently constructed Langley By-Pass Trunk will serve the eastern catchment, and the 68 Avenue trunk leading to the pump station at 176 Street will serve the western catchment (as shown in Figure 7.3.1 in Appendix I). Both these systems flow to GVS & DD Cloverdale Interceptor running parallel to 56 Avenue.

As development progresses, three sections of the trunk sewer will require to be upgraded on the eastern system:

1. Sewer on 196 Street from 64 Avenue to Fraser Highway;
2. Sewer on Highway #10 (Langley By-Pass): 196 Street to 56 Avenue; and
3. Sewer on 196 Street from Fraser Highway to Highway #10 (Langley By-Pass).

The upgrades of section 1, 2 and 3 of the sewer will be triggered once a total of approximately 48, 77 and 91 hectares of development respectively are completed within the eastern catchment of the NCP.

Similarly, two sections of the 68 Avenue trunk sewer and the interim pump station at 176 Street will require to be upgraded for the western system as development progresses. A deep Cloverdale Trunk Sewer will potentially replace the pump station at 176 Street when the ultimate 400 L/s flow has been reached. However, developments in this NCP are unlikely to trigger this work as the trunk services the whole Clayton catchment, not just East Clayton.

Water

Water can be supplied to the study area from four main feed points:

- 200 mm diameter water main at 72nd Ave and 192nd Street
- 150 mm diameter water main at Fraser Highway and 192nd Street
- 150 mm diameter water main at 72nd Ave and 194A Street
- 200 mm diameter water main at 64nd Ave and 194A Street

The existing local water distribution system services only a small area of the neighbourhood and does not have adequate capacity for future development. A network of new feeder and major grid mains of size between 300 mm and 450 mm diameter, connected to the existing Clayton Pump Station and GVWD trunk main, is proposed to extend into the neighbourhood to provide water supply for the ultimate build out (as shown in Figure 7.4.1 in Appendix I).

This new network, together with extensions on new roads, will be adequate to service the proposed land use. Each development will be required to demonstrate that they have adequate water supply for domestic and fire fighting use

for their development under interim and ultimate conditions.

The feeder and major grid main and the Clayton pump station upgrade are included in the 10 Year Servicing Plan. The Clayton Pump Station will require major upgrade in order to meet the future peak demand flow conditions. The pump station is near its capacity and an upgrade is expected to be required in the next few years. The timing of the station upgrade and the water network will require coordination with the developments. DCC funding will be available where upsizing beyond the development immediate requirement is needed.

Transportation

All of the roads in East Clayton will require upgrading from the existing rural cross-sections to urban standards. As part of the sustainability principles of East Clayton, the street system has the following features:

- a tight road grid for improved connectivity and pedestrian access;
- minimized pavement and right-of-way widths;
- lane access to facilitate swale drainage infiltration systems within the boulevards of local roads;
- enhanced pathway system for pedestrians/cyclists; and
- extensive traffic calming.

Arterial roads bound East Clayton on three sides, 72 Avenue to the north, Fraser Highway/64 Avenue to the south and 196 Street to the east. 188 Street, a Major Collector, is the west boundary.

192 Street will be the only Arterial road internal to East Clayton and will be built to a parkway standard which includes a grassy swale boulevard with trees and multi-use pathway, while 194 Street and 68 Avenue will be the only internal Major Collector roads. The remainder of the network is comprised of two-way and queuing local road (alternative one-way travel with on street parking), except for the Business Park area, which also includes minor collector road (as shown in Figure 7.2.2., in Appendix I).

The local road system is based on the neo-traditional parking pocket standards with the enhancement of a swale drainage system in the boulevard for enhanced sustainability.

The use of lanes is an important component of the sustainability principles and character for East Clayton. Eliminating driveways from the local roads has the following benefits:

- Increases infiltration with low maintenance swale drainage system;
- Increases number of street trees which provides greater tree canopy coverage and improves the drainage sustainability;
- Doubles (at least) on-street parking supply, important for East Clayton due to lot density, coach houses and secondary suites; and
- Improves urban streetscape.

Pedestrian/cyclist opportunities have been enhanced for this neighbourhood through a combination of next-to-street, off-street and on-street routes. The road network has been established to facilitate future expansion of transit service for the neighbourhood with minimized walking distances to/from the bus stops.

Extensive traffic calming will be built into the neighbourhood. The following measures will be utilized:

- curb extensions (bulging) at virtually all intersections, which “pinches” the street thereby slowing traffic and

reduces pedestrian crossing distances;
- raised intersections at key pedestrian crossing locations; and
- coloured pavement at other important pedestrian crossing locations.

Drainage

Stormwater management is a cornerstone of the ecological sustainability strategy of this neighbourhood. One of the original objectives of the NCP was to provide a stormwater management plan that resulted in runoff that was similar to a forested environment and many of the strategies proposed in the NCP should help us achieve this objective. Since the sustainable drainage components such as on site infiltration deal with small frequent rain events but are overwhelmed by large storms, they do not replace the need for a conventional drainage system to protect life and property during the less frequent larger events.

The following paragraphs describe both the conventional drainage servicing requirements for larger storms and sustainable engineering approaches proposed for the East Clayton Neighbourhood for smaller more frequent events.

The East Clayton NCP area currently has a rural residential land use and is serviced mainly by roadside ditches and natural creeks. Surface drainage from the area flows to two major catchment areas:

- South-East catchment that encompasses 190 ha of land sloping to the south east and draining partially into McLellan Creek and partially into the Township of Langley storm sewer system through culverts across 196th Street towards the Nicomekl River;

- Western catchment is approximately 85 ha in size and slopes to the west draining into North Cloverdale Creek near 188th Street and Fraser Highway and flows into the Serpentine River watershed.

Off site constraints

Of the two drainage catchments described above, the catchment flowing to the Township of Langley storm sewer system has the most constraints, and limited capacity. Consequently the proposed plan has been developed to account for this constraint by providing detention ponds and flow diversions. Downstream of the NCP, portions of McLellan Creek have been enclosed limiting conveyance capacity to existing flow conditions. The plan has been developed in conjunction with the Township of Langley to ensure peak flows into McLellan Creek will not increase as a result of development through the use of ponds and diversions.

Detention Ponds

A total of five community detention ponds have been proposed for the NCP. Four ponds will service the South Eastern catchment and one will service the western catchment. Potential pond locations are shown in the Neighbourhood Land Use plan. The four ponds servicing the South Eastern Catchment will ensure runoff originating from the site does not exceed existing constraints downstream of the Neighbourhood along McLellan Creek and through Langley's sewer system. A storm sewer is also required along 196 Street to ensure runoff constraints in Langley's system are not exceeded. A detention pond constructed immediately to the west of 188 Street will mitigate anticipated increased flows from the Western Catchment into North Cloverdale Creek (as shown in Figure 7.5.1 in Appendix I).

These ponds represent ultimate build-out conditions. Interim ponds may be allowed, but only when lands for the ultimate proposed pond to which the subject area is tributary have been secured by the developer for the City. No DCC rebates will be provided for interim works.

On-site servicing

Due to the development industry's desire to construct homes with finished basements, developers within East Clayton NCP will be required to design storm sewer systems to convey runoff bellow the basement levels for a 1:100 year rainfall event rather than the 1:5 year rainfall in order to avoid frequent flooding.

Storm sewers that service areas greater than 20 hectares are deemed to be trunk sewers and are eligible for DCC funding and are included in the 10 Year Servicing Plan.

Sustainable development objectives and guidelines

Sustainable development objectives were incorporated into the East Clayton Neighbourhood Concept Plan. The plan contains Green Infrastructure Performance Standards and Guidelines that describe the overall site requirements with respect to sustainable best management practices. The main objectives of this strategy are:

- To protect and enhance the environment;
- To enhance community value, quality, and appeal;
- To increase access to, and variety of, recreational opportunities;
- To protect habitat, especially fish habitat; and
- To maintain stream hydrology and stream water quality.

Infiltration Best Management Practices (BMPs) are most critical to drainage. For building sites the requirement is an effective infiltration capacity of 12 to 24 mm/day over the total impervious area of each lot. This will most likely be achieved through the use of an infiltration chamber or trenches constructed on each site where native soil percolation rates are greater than 0.5 mm/hr.

A similar infiltration target has been set for specific streets as indicated in the NCP. Standard road cross sections provided in the NCP allow for road rainwater to filter through roadside swales and infiltration trenches.

Another significant sustainability measure associated with stormwater is the preservation of soils on building sites. All landscaped areas of a building lot will have a minimum depth of topsoil of 450 mm. This requirement ensures that the thin soils of the Clayton area are re-used to their maximum advantage to increase runoff absorption and that topsoil will not be permanently removed from the site.

Specific urban-forestry standards have also been defined in the NCP. These will help the overall project area meet it's stormwater management objectives by providing increased rainwater interception and reducing total runoff.

Cost of sustainable initiatives

The Engineer for the first developer within the NCP area submitted certified cost of $4200 for implementing on-site infiltration strategies. The cost of soil preservation measures has been estimated in the range of $300/lot. Roadside swales and perforated drainage systems has been estimated at $1200 per lot. The total additional cost for all the sustainability initiatives is $5700 per lot. These costs are significant but in line with previously reported expectations.

In an effort to mitigate these costs the City has applied and received an $ 862,000 grant from the Canada/BC Infrastructure program and a $ 200,000 grant from the GVRD to implement and monitor the performance of infiltration BMPs in East Clayton. Under this grant, developers can apply to get up to 75% (to a maximum of $3,750) of their on-site infiltration Best Management Practice reimbursed. Results from the monitoring program will provide confirmation on the value of these strategies and provide design criteria that can be applied both city wide and regionally.

Base level vs. enhanced model of sustainability

Given the substantial cost to provide all the sustainable initiatives and the uncertainty that the infiltration strategies will provide the anticipated benefits, a staged implementation plan is recommended. Under this plan only the lots for which grant funding is available will be required to implement the full suite of sustainability BMPs including on-site infiltration structures (enhanced level). These structures will be monitored over a number of years to verify their performance. Any new lots beyond the first 200 lots (that receive funding) will be required to provide a base level of sustainability BMPs (i.e. full soil retention, tree coverage. etc., as shown in Table 1) but will not be required to provide on-site infiltration structures. If results from the monitoring program indicate that the infiltration structures do provide appropriate ecological value and are operationally feasible, this will be reported back to Council and the regulatory agencies. This in turn could result in subsequent lots within the NCP being also required to have the full enhanced level of sustainability BMPs including infiltration structures. Ideally the decision to proceed with the requirement for the full level of sustainability BMPs should be taken preferably on a region wide basis. This will avoid one area of the City/Region having a higher cost of drainage servicing than all other areas. This overall decision would have to balance the cost of enhanced sustainability measures against ecological benefit and any reductions in the cost of downstream drainage infrastructure and be explored within a regional context. It is thus possible that this drainage standard could become a region wide requirement.

All other ecological standards associated with the Neighbourhood Concept plan should be implemented as directed in the NCP and indicated in base level in Table 1 in Appendix II. We believe the benefit of the base level will outweigh their reasonable implementation costs.

Financing

A financial analysis is included in the engineering servicing report. The cost has been identified for the necessary DCC infrastructure to service this area.

The following table summarizes the projected DCC revenues and construction costs for each engineering service area at full build-out. The DCC revenues in this table are based on the current DCC rates.

Services	Projected DCC Revenues	Projected DCC Expenditures	Surplus/(Deficit) Balance
Sanitary Sewer	$3,629,000	$4,687,000	($1,058,000)
Drainage	$8,380,000	$8,164,000	$216,000
Water	$4,166,000	$2,177,000	$1,989,000
Collector Road	$5,756,000	$5,520,000	($236,000)

As illustrated by the above table, the overall minimal deficit or surplus.

Development Phasing

Development will likely proceed from downstream sections of the drainage and sanitary systems to the top of the catchments. Developers progressing ahead of this sequence will be required to design, finance and build the

downstream infrastructure required. Ultimately as in other NCP areas the market will determine the actual development patterns and phrasings.

CONCLUSION

The East Clayton NCP servicing plan provides a comprehensive servicing and financial plan for the area. The proposed staged approach is recommended as it achieves a high level of sustainability while still ensuring the developments in East Clayton will be competitive within the regional context.

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Attachment

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APPENDIX I

East Clayton NCP
Proposed Servicing Plan Maps

APPENDIX 2

East Clayton NCP
Sustainability Components

TABLE 1

#	COMPONENT	PERFORMANCE ROLE	LEVEL OF SUSTAINABILITY	OBJECTIVE	DESIGN	COST
1	**On-Lot Infiltration BMP:** Dispersion BMPs such as storage and infiltration of run-off.	To disperse storm water runoff into pervious areas from paved and roofed areas and facilitate infiltration.	Enhanced	• Effective infiltration of 0.5 to 1mm/hr. • Connect the impervious areas to storage and infiltration area.	• Each development does percolation test to determine size of storage required. • Storage is related to percolation rate and impervious area.	$4,200/lot
2	**On-Lot Soil Preservation**	Preserve and enhance the soils natural absorption ability to decrease run-off.	Base	• Minimum depth of soil 450 mm of enhanced natural infiltration.	• Topsoil retained and deep tillage of sub-base.	$300/lot
3	**On-Street Measures:** Roadside swales and infiltration trenches.	Facilitate collection of runoff generated from lots, roads. Standard road cross sections provided in NCP allow for road rainwater to filter through roadside	Base	• Boulevards sunken in to allow for road water to drain in them through side inlets on curb. • Perforated	• Conventional sewer capacity analysis. • Perforated pipes when practical.	$1,200/lot

		swales and infiltration trenches.		system when practical. • Sidewalks graded to boulevards.		
4	**Tree Canopy** Trees/bushes in each lot boulevards, parks, etc.	Facilitate evapo-transpiration (E/T), add trees with high E/T potential in winter and summer.	Base	Full canopy cover objective: 40% Lots 60% Streets 30% Parks	• Appropriate landscape plan with appropriate species. • Minimum size specified for trees.	Minimal additional cost.
5	**Storm Water Ponds** Storm Water Detention facilities on a regional basis and within strata developments, commercial, and industrial sites. Specific locations as shown in Figure 7.5.1.	To detain net runoff from upstream areas and then gradually release to the downstream receiving system. These facilities play a critical key role in managing flows into the existing downstream systems.	Base	Enough land is secured to ensure ultimate pond can be built, assuming the on-lot measures are ineffective.	• Ponds would be constructed, assuming a 50% effectiveness of the on-lot and on-street systems. Ponds could be expanded in the future at a nominal cost.	Nominal savings.