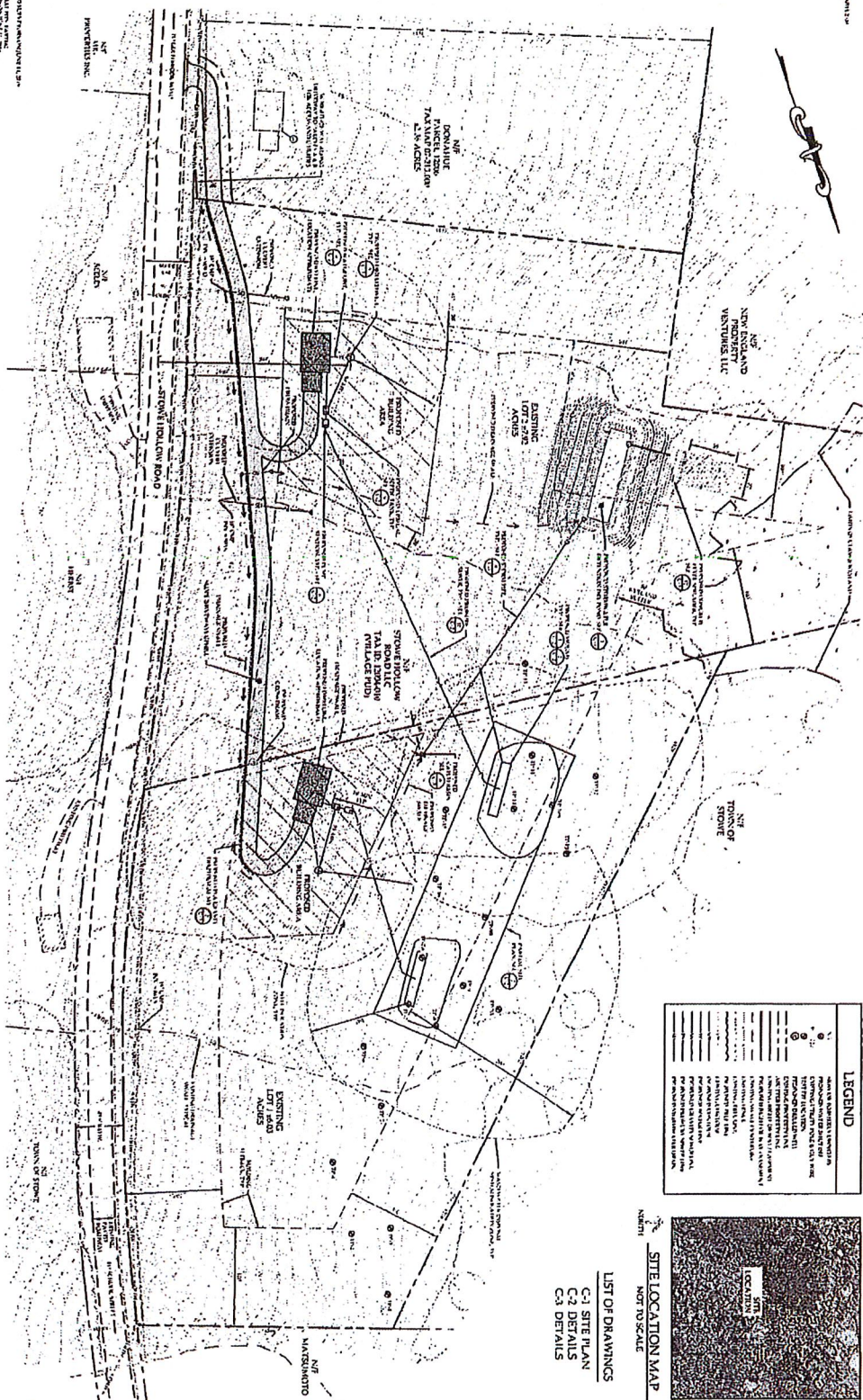


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1. **PROBLEM STATEMENT**
The problem is to design a control system for a plant with the transfer function $G(s) = \frac{1}{s^2 + 2s + 1}$ such that the closed-loop system is stable and the steady-state error is zero for a unit step input.
2. **SYSTEM ANALYSIS**
The plant is a second-order system with a pole at $s = -1$ and a zero at $s = -1$. The system is marginally stable.
3. **DESIGN REQUIREMENTS**
The control system must be designed to meet the following requirements:
 - a. The closed-loop system must be stable.
 - b. The steady-state error must be zero for a unit step input.
 - c. The system must have a damping ratio $\zeta = 0.7$ and a natural frequency $\omega_n = 2$ rad/s.
4. **CONTROL STRATEGY**
A PID controller is chosen to meet the design requirements. The controller transfer function is $C(s) = K_p + \frac{K_i}{s} + \frac{K_d s}{s + \alpha}$.
5. **PARAMETER TUNING**
The controller parameters K_p , K_i , and K_d are tuned to meet the design requirements. The values are $K_p = 1$, $K_i = 1$, and $K_d = 1$.
6. **SYSTEM RESPONSE**
The system response is simulated for a unit step input. The response shows that the system is stable and the steady-state error is zero.
7. **CONCLUSION**
The control system is designed to meet the design requirements. The system is stable and the steady-state error is zero.

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STOWE, VERMONT

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REVENUE 100000

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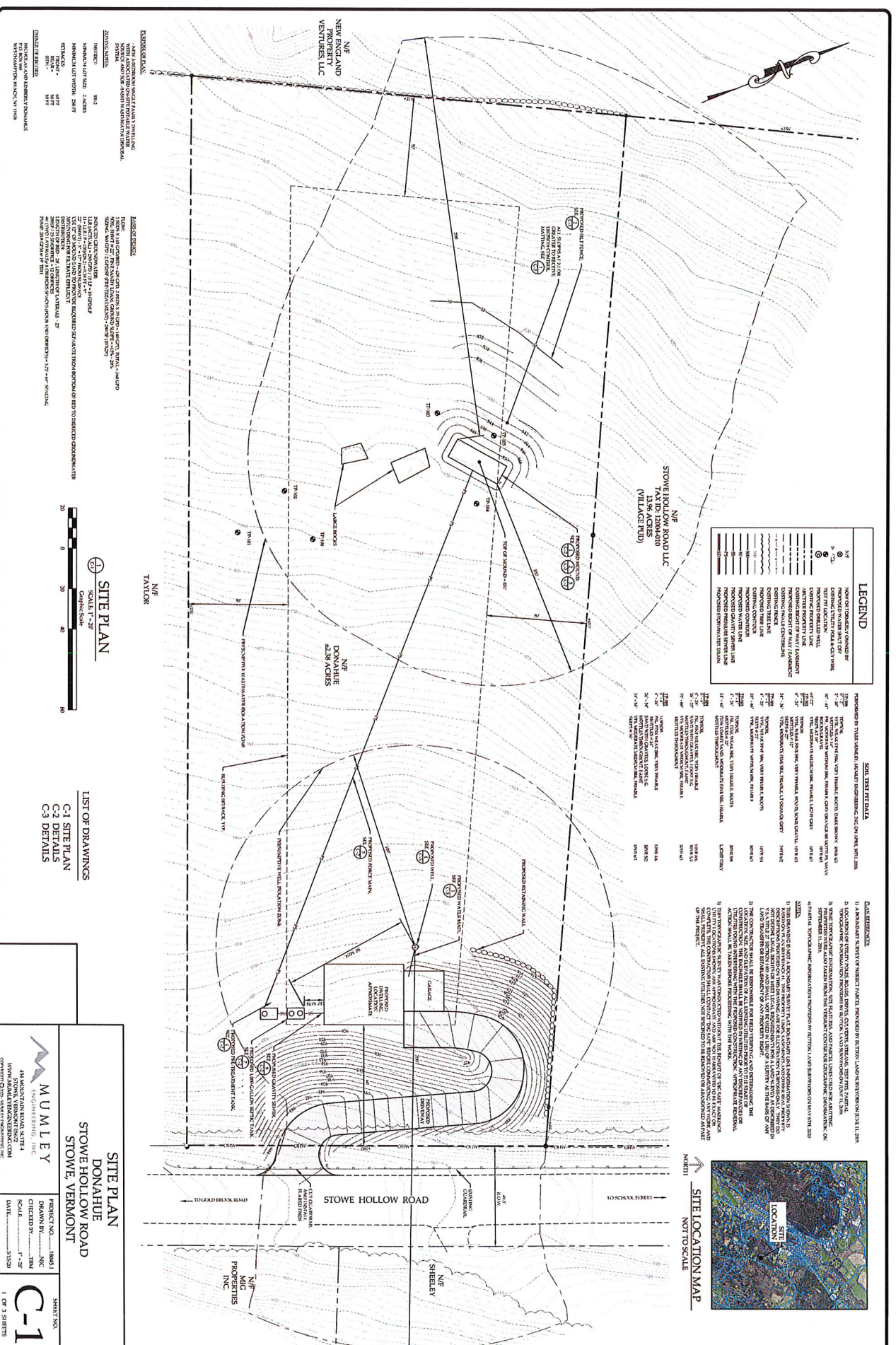
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ENGINEERING, INC.

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100 W. 42nd Street, 4th Floor
New York, NY 10018-0044
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